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An Address

ON

THE MENTAL FACTOR IN DISEASE AND ITS TREATMENT BY THE GENERAL PRACTITIONER*

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I HAVE chosen this topic for consideration because I think the importance of the mental factor in disease is insufficiently appreciated by the general practitioner, and because I have been specially interested in the subject for many years.

The last forty years have revolutionized medicine—the rapid advances in physiology, the rise of pathology, bacteriology and bio-chemistry, the ever widening knowledge of the ductless glands, the contributions of surgery and of the x-rays, have made the present generation of medical men frankly materialistic and unwilling to accept any explanation of disease which cannot be controlled in the post mortem room, or in the laboratory with culture tube, microscope or biochemical method. In the wards, our clinical material for teaching has been drawn almost exclusively from acute disease, or chronic disease with readily demonstrable organic findings, and the out-patient department of our hospitals, with its wealth of cases illustrating early structural change and functional disorder, has been, till recently at least, utilized but sparingly in teaching medical students.

In the enthusiasm aroused by our rapidly widening knowledge of the physical factors in disease, comparatively little attention has been devoted to the mental factors associated, while the semi-contemptuous discussion of hysteria by

the average teacher served only to create in the student mind, the impression that here one had to deal with exceptional suggestibility and exceptional weakness of will. Hence the rank and file of the profession in the past have started off with absolute ignorance of the mental factor in health and disease—nay more, with a strong prejudice against neurotics—a prejudice which naturally prevented them from later entering into sympathetic relationship with, or understanding of, these sufferers.

It is true that medical science has been reaching out towards this problem from another angle. Amplifying the idea of structural change as the sole basis of disease, comes the finer conception of disorder of function, with changes as yet not detectable in the post mortem room. Along with the functional conception of disease, the physiologist and clinician alike now recognize more fully the interaction and mutual dependence of the bodily organs. In such a reckoning, the nervous system, as exhibited in the functional activity of the mind, cannot be left out of the reckoning. Thought, feeling and action, the highest functions of man, influence, and are in turn influenced by, all the other organs of the body. Sherrington and Head have laid the foundations of our knowledge of reflex action, simple and compound, in the lower animals and in man, while Pavlov has added the "conditioned reflex". The autonomic nervous system

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and endocrine glands have been linked up with the emotions through the work of Langley, Gaskell, Cannon and other investigators.

The old psychology of the individual, apart from his social setting (a psychology which afforded no material for the understanding of human behaviour) has been supplemented by a social psychology, and by the study of behaviour in the lower animals; the behaviourist school has arisen, boldly asserting that the conduct of any man is but the sum of his conditioned reflexes. But this conclusion is strongly combated by other psychologists like McDougall, who asserts that human nature and human action are not capable at present of being adequately explained or described in terms of nervous structure and function, but must be dealt with in terms of mind.

The speculative genius of Freud has stimulated psychological research enormously; with the rise of psychopathology, neuroses, insanity and crime came to be looked on as a failure of individuals to adjust themselves adequately to the demands of social life. The objective psychopathologists, like Hamilton, are now busy translating Freudian concepts into terms of behaviourism. Ultimately no doubt, a unified knowledge will be possible; in the meantime, I think the physician may approach the neuroses from the mental angle, supplementing and modifying his viewpoint by all relevant physiological advance.

Turning now to the diagnosis and treatment of the mental factor in disease. The older one gets, I think, the more impressed one becomes of the value of a very careful and full history of all diseases, organic or functional. My own practice is to get the patient's story of his present illness, followed by the history of previous illnesses and the family history; usually one thus hears mainly of the physical factors, and I do not seek specially to elicit possible mental factors until a thorough physical examination of the patient stripped has been made. Special laboratory and other tests may be indicated by the history or physical examination. The preliminary physical history and examination form a much needed check on a possible tendency to see disease from the psychic angle alone, and give the patient time to acquire the necessary confidence in the physician, without which, enquiry into the

patient's mental life will necessarily be fruitless.

The diagnosis is the best trump in treatment and only by accurate diagnosis, can the conscientious physician be distinguished from the charlatan. At the outset, we are concerned in excluding organic disease—a difficult task in so many cases. In the humility born of so many errors in the past, we should try to detect the early symptoms of organic disease, but must guard against originating by careless word or look, doubts and fears in hitherto healthy subjects. For we have all seen physically healthy people, whose symptoms appeared only after a medical examination.

I venture to repeat what I said on this subject four years ago: "If in doubt, after careful examination, the physician should usually give the patient the benefit of the doubt. More real suffering is induced by a mistaken diagnosis of organic disease, than by occasionally overlooking it. Discomforts all too readily become disabilities under the fostering influence of suggestion. If it is considered a reproach for a surgeon to have a clean wound go septic, it is high time to protest against the physician instilling doubt and fear into a healthy man." We medical men are, I think, habitual pessimists in the face of some unusual symptom or physical sign, as James MacKenzie so emphatically pointed out in heart cases.

We may divide our patients into four groups: First: those who are suffering from acute disease or from advanced organic disease of such a character that all their symptoms are readily explicable from the physical standpoint. This group, in my judgment, not a large one, does not concern us here.

In the second group, we include quite healthy individuals who are in doubt about this or that unimportant symptom—a passing ache on the right side of the belly, a soreness over the heart, a momentary dizziness. Here a specially careful examination should be made of the part of the body implicated, after the usual history and general physical examination; it is also wise tactfully to find out what the patient is afraid of, and why. We can then give much more specific reassurance, and are more likely to remove the disturbing symptom or at least make the possessor barely conscious

of it, if his viewpoint has been discounted only after consideration.

In passing, it must be emphasized that such trifling symptoms may be the earliest sign of serious organic disease. Thus, for some months, I unfortunately regarded as neurotic a Jewess, whose main complaint was a localized pain to one side of the dorsal spine; a sudden paresis of the lower limbs corrected the diagnosis to spinal cord tumour, which was later verified by operation.

In the third group, there is organic disease of which the patient may be aware—albuminuria, valvular disease of the heart, disseminated sclerosis, thyroid enlargement, or what not. Now, as Parry long ago pointed out, if organic disease is found, the patient himself counts; it is much more important often to know what sort of patient has a disease than what sort of disease the patient has. It is too readily assumed that all the symptoms complained of by the subject of organic disease, are due to that disease. Yet very frequently the main disability is induced by doubt and fear, excited through knowledge of the disease present, and provoking emotional reactions in the shape of various bodily symptoms. Thus a number of patients with organic disease of various kinds, left me for Christian Science, finding in that strange doctrine, freedom from symptoms and peace of mind not attained under my treatment. And no inconsiderable proportion of "cures" at the hands of osteopaths and other irregulars depends on the same neglected factor.

This combination of functional and organic disease may be illustrated from my experience: For eight years, I have had under my care an unmarried lady of thirty-five, with an enlarged and rapid heart, associated with aortic insufficiency and mitral stenosis. Septic tonsils, the only source of focal infection discoverable, were removed; the basal metabolic rate was normal; the patient's general condition was good, though she complained of weakness, and breathlessness on exertion, and preferred to use three pillows at night. For four years, I restricted her activities very greatly; her people were in easy circumstances and she fell into the rôle of a semi-invalid readily. I found, however, that on two occasions when illness in her family threw greater responsibility on her, the heart improved rather than tired. Now for three years, I have

encouraged her to do a good deal more with no ill effect to the heart, and with a marked improvement in her morale. A year ago, Dr. Richard Cabot of Boston confirmed my view of her case.

Similarly, I saw overseas three soldiers with congenital cardiac lesions, who had carried on perfectly well at the front, till sent down the line for flat feet or similar non-infective disability. The heart lesion was discovered and evidently misinterpreted in hospital, where all three developed marked neurotic cardiac symptoms, and these constituted the main disability. This interpretation was confirmed in one case by Sir William Osler, and in another by Colonel Finley of Montreal.

With angina pectoris there is frequently an associated nervous element, which is very liable to be overlooked. When the cases of coronary occlusion which are rapidly fatal, or at best leave behind very marked cardiac weakness, are excluded, we have a fair number of patients with angina who survive for many months and often for some years, continuing comfortably at sedentary work, while living within their cardiac income. Particularly if we find a patient developing anginal symptoms on slight provocation one day, and yet able to tolerate considerable strain the next, we should look for some associated factor, which may be of course a passing infection, or indiscretion in diet, etc., but which is frequently neurotic in origin. There is naturally a close association in the lay mind between heart disease and sudden death, yet such association is justified, we physicians know, only in a limited number of cardiac cases, among which angina pectoris bulks largely. It is so often not the disease, but the patient's absurd notions about that disease, which determine the symptoms complained of.

The discovery of high blood pressure frequently excites neurotic manifestations, and many unhappy individuals have their interest centred round the fluctuations of their blood pressure. The exploitation of this by quacks should make us the more careful to secure the necessary hygienic and dietetic precautions without unnecessarily alarming the patient.

"Hardening of the arteries" is a term of very evil omen to the lay mind and is used much too loosely by physicians. Albuminuria

in young people, unaccompanied by any other evidence of organic disease and often obviously orthostatic in origin, is too frequently treated with unnecessary restriction of diet and activity; when a boy or girl cannot take part freely in games and sports, a grave feeling of inferiority is often engendered, which may leave permanent traces in the character.

It is well known that many cases of chronic renal disease of even moderately advanced type, as shown by considerable rise in blood pressure and enlargement of the heart, with the associated urinary changes, can carry on for many years with little apparent disability. No doubt their lives should be regulated, their diet supervised sufficiently, but unnecessary restrictions and alarm should be avoided, and this is often forgotten. The suspicion must arise that many of the symptoms complained of by other patients in apparently similar circumstances must frequently be accidental or purely neurotic in character. I do not wish to be misunderstood; so many complicating factors are here concerned, apart from the functional efficiency of the kidneys—we have the state of the arteries, notably in the brain, the condition of the heart, the state of the body generally, the type of work demanded and above all the type of patient concerned. I merely plead for the recollection of possible emotional reactions which may be responsible for some of the symptoms complained of.

The crest of the surgical wave at present is bearing, I think, on the thyroid, and is bound to recede somewhat; we have, I think, unnecessary alarm in girls under twenty-five with simple goitre, and even in hyperthyroid cases, the influence of chronic emotional states in perpetuating symptoms must be reckoned with.

Disseminated sclerosis sometimes develops rapidly with resulting paresis of the lower extremities; such weakness often clears up entirely, though a tell-tale extensor response and absent abdominal reflex still mark the latent disease. As Hurst has emphasized, such cases, correctly diagnosed, may lie around for months after full power has returned to the limbs, simply because they were not specially encouraged to get round. It is fatal for a pessimistic physician to label a patient with an incurable disease.

Nowhere do we find organic disease and neurotic symptoms more intimately associated

than in many enteroptotic individuals, and this complexity has been, I think, largely responsible for the failure of measures taken either purely from the mechanical, or purely from the mental side. While removal of the appendix for the common right-sided ache, freeing of adhesions and stitching up of organs have been conspicuous in their failure to relieve symptoms, simple psycho-therapeutic treatment is very frequently just as impotent.

In passing, I may touch on the difficulty the physician is placed in when he recognizes very early a case of slowly progressive and incurable disease. Thus I saw eighteen months ago, a man of forty-two years, in whom the only complaint was that in walking he did not swing one arm; he added that the condition did not bother him, and that if reassured, he would dismiss from his thoughts the trifling disability. The case was obviously one of commencing paralysis agitans. Now recently, in a Lettsomian lecture, Farquhar Buzzard has claimed that in just such a case the physician should from the outset tell the patient frankly what is before him. I have doubts whether such frankness is in the best interests of many patients we see, as for months or even years after, the disability may be so slight that in the absence of such grave warning, comparatively little interference with enjoyment of life may be experienced.

We pass now to the fourth and last group—the psycho-neurotics. It is often obvious early in the interview that all the symptoms are those of functional nervous disease; just in these cases, there is need for a most careful physical examination preceded by a careful history from the physical angle. So often one finds some defect, some slight deviation from health, which forms the organic starting point for the neurotic symptoms. In one case, it may be slight deafness; in another, flat feet curtailing early physical activities; in yet another, a poorly developed penis, arousing quite unnecessarily a feeling of inferiority. The physician can here help greatly by correcting, if not the physical defect, at least the exaggerated emotional reaction aroused.

The history may too reveal that the neurotic symptoms appeared only after the subject was run down by overwork, debilitating illness, such as influenza or by excesses. In the prairie provinces, many farmers' wives with several

children and without assistance at home, present a real problem in which overwork and actual exhaustion play a great rôle in the development of neurotic symptoms. Usually to these physical factors, others of mental origin are associated—financial worry, domestic indifference or actual unhappiness, monotony of life, etc. There is a third reason why a thorough physical examination and evaluation of the ordinary history should be made; for only then can the physician with assurance proceed to consider the case from the psychic angle.

Now when the ordinary physical examination reveals nothing which will adequately account for the symptoms complained of, "the man above the eyebrows" must be considered. The general practitioner has the great advantage of seeing these patients early and in their homes; the hereditary influences, the domestic life, the special difficulties in the case, (factors only imperfectly elicited by the consulting physician) lie open before the family doctor, if he but care to study the human comedy or tragedy enacted in the home with a sympathetic eye.

The hereditary factors are particularly important; one must not expect A1 children from C111 parents. For we start in life with a varying handicap; some the fortunate of well-balanced parents and with a happy childhood; others of a weaker strain, physically and mentally, with the primitive instincts and their attending emotions initially harder to control—a deficiency accentuated by the example and foolish training given by the unstable parents. The influence of parental unhappiness, separation or divorce, of quarrelling in the family, of foolish grandparents, or doting friends, throws a shadow far into the child's adult life. It is surprising how frequently such factors can be elicited in the history of psycho-neurotics; an important consideration, as much has been put to the score of heredity which is really due to early influence and training in the home.

We must remember the neurotic is in trouble; he cannot adapt himself successfully to the claims and duties laid upon him in his social environment. By tact, patience, and sympathetic understanding, the patient is induced to talk freely of his present discomforts and disabilities, and to tell how they arose; his personal difficulties and problems are then taken up and this

paves the way to an understanding of his family, his social and business relationships, and his reactions to the situation disclosed. The hereditary and the childhood influences, the past difficulties encountered, must often be investigated, while in men and married women, the sexual life may be enquired into freely. A boy will usually tell of any sexual difficulty present if a little tact and reassurance be displayed, but I have generally avoided direct questioning of girls and unmarried women, unless it was obvious that questions of sex were involved. In all this work, the personality of the physician counts for much, but even those of us who are not richly endowed may, if interested, establish in some degree the favourable atmosphere necessary for such a delicate discussion.

Hamilton remarks—and the point is a good one—that he holds the patient to an orderly account of himself by constantly reminding him that the most important question is: "to what things are you now responding inadequately and how are you responding to them?" Thus cornered, very many patients will supply with little difficulty information of personal problems, to which they are obviously reacting inadequately, and will sometimes add that they themselves had suspected that in the unsatisfactory solution of these problems lay the cause of their nervous symptoms. Yet these patients, though dimly aware where the difficulty lay, gave often a history of prolonged local treatment, of dietary restrictions, and of drug taking prescribed by physicians of too materialistic training.

In many cases, as Ross remarks, it will be found that the patient knows that he has certain personal anxieties; he knows also, but as a separate and unconnected fact, that he is ill with certain symptoms—such as headache, depression on waking in the morning, palpitation or indigestion. He will often insist that there must be some physical cause to account for his bodily symptoms, and will resent the implication that the latter are secondary to his inadequate adjustment to life. Yet the domestic unhappiness, the loss of fortune, the thwarted ambition, the unexpressed but ever present fear, the secret sin—factors such as these, inadequately faced with resolute acceptance of all the implications, are by the subtle chemistry of our emotions transferred into physical disabilities.

For under emergencies which, in the animal

would produce fight or flight, and which in man are attended with pain and great emotional excitement, the sympathetic division of the automatic nervous system is stimulated, influencing in turn the suprarenal medulla, the liver and the thyroid; apparently too, the cranial and the pelvic autonomic divisions are influenced. The sympathetic division acts as a whole, influencing all the viscera through its increased or decreased tone; the cranial autonomic which includes the vagus nerve, acts on the viscera with discriminating and particular action; the sympathetic, as Cannon says, is like the soft and loud pedals, modulating all the notes together; the cranial autonomic is like the separate keys.

Hamilton points out that in man, baffling situations in which the patient reacts over long periods irrationally, with anger, sorrow, anxiety or with a sense of grievance—correspond to emergencies, and influence the vegetative functions similarly; yet this very emergency reaction, life saving in animals and in physical crises in man, may be a positive detriment where the baffling situation must be met by rationally determined adjustive measures, as it introduces a distracting awareness of the bodily mechanisms. An example may be given:

An auto mechanic of thirty-two, married, with two children; always well till a year ago; served with distinction overseas and without breakdown for four years in a fighting unit; complained of nervousness, weakness, palpitation, lack of appetite and vague pains. Physical examination was quite negative. Just prior to the onset of symptoms, the foreman in the large works died, and after a month's delay and hope, another man was appointed foreman, purely on grounds of seniority, though my patient was told he was the better man for the job. He had known the new foreman overseas and despised his record in the army. The foreman took advantage of his position to criticize and make trouble. My patient had a chronic sense of grievance; brooded over the situation "like a rat in a trap" as he put it. The pay was good; as a married man with children, he was afraid if he gave up his job as he wished, he might not get another position. He reacted to the difficulty as to an emergency, with resulting disturbance of his vegetative functions as seen in palpitation, lack of appetite, etc.

Many such patients are met with; the conscientious married woman with a dissolute husband, the unmarried daughter with an urge for self-expression outside the home, yet compelled by a sense of duty to assist the mother, the business man whose affairs are critical, etc.

Now it is obvious that the cure for such patients lies in their dispassionate survey of the situation; in their resolute and rational accept-

ance of the inevitable with a corresponding adjustment of their behaviour. This too may be tentatively translated into physiological terms, as Hamilton suggests: "We have reason to believe that this (rational) type of adjustive function involves the distribution of neural energy in complex patterns which are largely composed of cortical intercalary neurons, and which do not importantly include the autonomic neurons. In other words, purely rational reactions to experience do not involve emergency interferences with vegetative functions."

The practical difficulty is that it is impossible in many instances to get the patient to adopt a rational stand to his difficulties; intellectually, he acknowledges the necessity but the lower type of irrational non-adjustive behaviour is too engrained in his nature to be overcome. For, to put it in McDougall's words, "The instincts are the prime movers of all human activity and all the complex intellectual apparatus of the most highly developed mind is but the instrument by which these impulses seek their satisfaction; they are the mental forces that maintain and shape all the life of individuals and of societies." Yet some of these patients can be induced resolutely to face the music and to make the best of a bad job. I turn now to a thorny problem, which I may introduce by an example:

An unmarried woman of thirty, a stenographer, consulted me some years ago, because men looked at her in a "meaning way" on the street, and sometimes even in the office—she felt that, by look and gesture, they made improper advances to her, and behaved as if they read in her eyes a responsiveness to their lascivious feelings which she never shared. She thought there must be something wrong with her physically, to produce such a reaction in strangers. Physical examination was quite negative. I had known the family for some years, and knew the high reputation the girl had, both with her employer and with her associates generally. She denied at first ever having had sexual feelings, and went away with a general reassurance about her health; returning some weeks later, she admitted masturbation from early girlhood, but claimed she had now overcome the habit, and was never troubled in that way. Within a year, she was in an asylum where she masturbated shamelessly, and made erotic advances to the attendants.

Such a history, many of you no doubt can duplicate, and none will dispute that the girl was reacting to sex stimuli, inhibited from direct expression. On attempting a closer analysis, wide divergence of viewpoint becomes apparent. According to the Freudians, the powerful sex impulses pressing for satisfaction are here in conflict with the girl's developing

standard of morality; in consequence, they become forgotten, repressed from consciousness by an active psychic process, and fall into the unconscious, from which they are prevented direct escape by the action of the censor, which corresponds to the conscience of the patient. But though banished and prevented direct expression, these repressed desires retain their energy and find indirect outlet through the symptoms complained of.

Hamilton makes a very interesting attempt to translate the Freudian concepts of repression and indirect expression, illustrated by my sex-possessed patient, into the language of behaviourism. "When an organism", he says, "is unable to acquire relatively complete unresponsiveness to a stimulus, direct responsiveness to which is disadvantageous, it tends to react indirectly and usually dysteleologically, to the stimulus." An ingenious experiment with monkeys offers an experimental example of the mechanism of Freud's "repressed desire" with indirect outlet.

Timmy, a male, and Kate, a female monkey were confined for some days in one of the eleven small compartments into which a tall narrow cage was subdivided. While so confined, Timmy simply bullied his mate without attempting to injure her. A male dog was then introduced into the floor of the compartment. Timmy cautiously descended to the floor, played for some time with the dog, and finally attempted to copulate with him. This was resented by the dog which growled and snapped, causing the monkey to beat a hasty retreat up the side of the cage. From a safe distance, Timmy gnashed his teeth and croaked angrily, evoking fierce barking and upward leapings from the dog; this reciprocal behaviour was repeated several times. The monkey then ignored the dog altogether and began to look about him in all directions, angrily gnashing his teeth but never looking down at the barking dog below. He then slowly ascended one side of the cage, still gnashing his teeth, till he could see the tip of Kate's tail hanging over the shelf above. At this, Timmy made a dash for Kate and attacked her so savagely that she had to be rescued. Other male monkeys showed the same tendency to discontinue direct responsiveness to the dog and to attack unoffending hitherto friendly mates.

Hamilton considers that, in these cases, the primary stimulus remains dynamic for behaviour rather than the inhibited primary adjustive impulse, as he calls Freud's repressed desire.

In any case, whether one inclines to the Freudian, the more orthodox psychological, or to the behaviouristic standpoint, all agree in treatment—the necessity for the patient to overcome his amnesia and face his real difficulties in a rational way.

One further physiological mechanism must be referred to, as it is of great importance in

psychopathology — "the conditioned reflex". Pavlov showed that, when attractive food is presented to the nose of a dog, saliva is poured out and that if on several occasions a bell is sounded at the same time as food is presented, the sound of the bell alone will in time suffice to evoke a flow of saliva. Similarly, Watson showed that if a green light be flashed repeatedly in front of a subject whose foot was at such instant electrically stimulated, the upward jerk of the foot which was the normal response to the electrical stimulus, would in time be induced by the flashing of the green light alone. Watson further suggests that conditional emotional reflexes can be similarly aroused. This principle is very valuable in explaining some at least of the irrational fear reactions or phobias which are otherwise so puzzling. The following case may be cited in illustration of the principle of the conditioned reflex.

A married woman of forty complained of attacks of palpitation, of pain in the cardiac region, associated with numbness and trembling of the hands, ending in twenty minutes or so in a crying spell and exhaustion. Such attacks had come frequently for some years without obvious cause, and now threatened to interfere seriously with her enjoyment of life. Physical examination was quite negative; she had always been assured, on previous examinations by other doctors, that her heart was normal. Pressed to recall if possible when the first heart attack occurred and in what connection, in a two hours' sitting she was able to her great surprise to do so. About fifteen, being musical, she had dreams of a professional career but her father refused to allow her further musical education. With the help of an elder brother, however, she took lessons in secret for some years and even appeared on local platforms. This came ultimately to her father's ears and gave rise to some bitter scenes between them, in which she naturally suffered from palpitation, pains in the heart, trembling, weeping and exhaustion. The memory of the cause faded, but the attacks recurred and had continued after her father's death, and after all dreams of a professional career gave place to a busy and happy married life crowned with healthy children. Yet she now significantly recalled that the heart attacks came particularly when she attended concerts, or if she overheard quarreling even among strangers. I pointed out to her that she could now choose whether she would react to an old situation, previously influencing her unwittingly; her attacks at once disappeared and have not returned in the last three years.*

Phantasy is a primitive form of mental activity, normally seen in the make-believe of children, but indulged in to a varying extent throughout life. One hardly realizes—though the popularity of the movies and of much of the current literature should teach us—how often when difficulties occur in life, the realm

* In the address the histories of other similar cases were given, but are omitted for lack of space.

of phantasy appeals with its easy triumphs, with its psychic opium. It is a dangerous and enervating world to linger in too much. So many are influenced by their past. "Situations and experiences," says Hinkle, "which should have been completed and finished long ago are still dwelt upon and lived with. Images and matters which once were important but which normally have no significance for their later age are still actively influencing their lives."

In these days of hurry, the *value of rest*, relative or absolute, for some types of neurotics is apt to be forgotten. The over-worked farmer's wife who is becoming nervous, may require a little more consideration from her husband who has thoughtlessly allowed her to reach the breaking point, and a girl to help in the house temporarily at least, may be necessary. In more severe cases, a prolonged stay with friends, with freedom from work and worry, and with generous diet, enables the patient to regain weight and mental poise, confident reassurance being sufficient psychotherapeutics. In a few cases, one must institute in hospital a modified Weir Mitchell treatment for some weeks, followed if possible by a complete change before return home. Rest in bed in hospital or nursing home is also required in neurotic and emaciated young women who without any physical cause have been taking less and less food. Here, with the patient's appetite gone, it is often wise to commence on Dubois' milk diet—two and one-half ounces of milk every two hours for the first day, the quantity of milk being rapidly increased to three quarts daily, after which full diet can be given, if the physician has secured the patient's co-operation and confidence by tact and calm reassurance. Barker has recently endorsed the value of Dubois' milk diet in commencing treatment of such cases.

Home treatment of an emaciated girl is very unsatisfactory; supervision of letters and of visitors is necessary in hospital; as the patient improves, she is encouraged to discuss her present difficulties and problems of the home. Armed with this knowledge and with a growing insight into the patient's personality, the physician may be able to suggest certain obviously advantageous changes at home, and secure the co-operation of the family, or by getting the patient frankly to face her problems, may assist

in mental readjustment, or at the worst, acceptance of a difficult family situation.

In all ages, we may find that simplification of life is necessary in treatment; the business man, becoming sleepless and neurotic, must give over detail work to subordinates and take longer hours for recreation; the teacher must perhaps sacrifice her Sunday school and church work, so securing rest at the week end; the middle aged woman with heavy household duties, must give up some of her social activities, while those who have inherited an obviously unstable nervous system, must respect their limitations by choosing light occupation and simple environment.

Janet has particularly drawn attention to the *value of excitation* in certain psychoneuroses; "How many people fall sick because they have nothing of interest to do, because their life is commonplace, dull and monotonous; because they have no hope, no ambition, no aim; because no one is interested in them, and because they see no prospect of arousing any one's interest." Thus it is insufficiently recognized that among the young women of the well-to-do classes of the present day, many neurotic symptoms arise, simply from the lack of an absorbing interest or hobby. Marriage is no longer the be-all and end-all of women's existence; with business and professional careers now open, many young women are dissatisfied at home. Hence the physician can sometimes effect a transformation in his patient by getting her to take up work of some kind, or by overcoming the objections of parents to her legitimate aspirations in business or professional lines. So too, there is the problem of the woman of middle age, who married young, who was too busy rearing her family to develop other interests and who now finds, with children grown up and married, with ample help at home, little to occupy her.

In many cases, it is not wise to be content with reassurance, encouragement and suggested readjustments; the symptoms, neurotic though they be in origin, may reasonably be attacked directly. Much of the success of osteopathy seems to me due to the impression made on the patient of having something done for them, and it is high time for the physician to utilize massage, hydrotherapy, special exer-

cises, etc., more than he does. Where then a cure or marked improvement cannot be effected by psychotherapy alone, it is absurd for the physician to refuse the aid, largely suggestive though it may be, of physiotherapy, nor need the assistance of drugs such as adalin, bromides, etc., be altogether despised in our professional zeal for scientific treatment.

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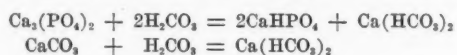
ON

THE BIOCHEMISTRY OF CALCIUM*

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AN ELEMENT is either essential to life, which means that if it be deficient or absent life is pathological and ultimately ceases, or it is non-essential, and life can proceed normally without it. Calcium is an essential element. How does the living organism obtain its calcium? Plants obtain it from the soil, and animals from plants directly or indirectly, as they are herbivorous or carnivorous. Since both calcium and the phosphates are essential to plants it is not surprising that calcium carbonate and calcium phosphate are two of the most important soil compounds. Most soils contain both, calcareous soils contain excess of carbonate, and soils deficient in these compounds require lime and phosphate dressing for normal plant growth. The soil water contains carbon dioxide in solution, and the growing plant excretes more from its roots. The carbonic acid of the soil water brings into solution the necessary amounts of both calcium and its phosphate, converting insoluble limestone and phosphate into soluble acid salts:



For plant growth the actual calcium requirement in soils is not great; it varies for different plants, but is always less than 1 per-

cent. Since calcium, in whatever form present in the soil, is by plant action slowly converted to soluble salts, it is removed from the soil not only by the plant, but by being washed away. Plants can remove a great deal. Thus the vines of the squash have been found to contain calcium to the extent of 6 per cent of their dry weight, which represents a removal from the soil of 300 pounds of calcium carbonate per acre. The actual function of calcium in the plant is not clear, but it is agreed that in minute amounts it favourably affects the germination of seeds, this action being specific, and that it gives tone and vigour to the plant, stimulating growth. Entire lack in the nutrient medium checks growth and leads to death of the plant. Different species of plants contain different amounts of the element; different parts of the same plant contain different amounts. Seeds, roots, and tubers are poorly supplied; the green parts are especially rich. Straw contains little. Most of our common plant foods contain small amounts, and it has been calculated that a generous diet of such foods as cabbage, celery, squash, spinach, lettuce, and asparagus will satisfy man's requirement. Evidently green food is the greatest source of it for herbivorous animals.

* Delivered before the Winnipeg Medical Society on March 19, 1926.

Studies of soil requirements for plant growth suggest that there are certain antagonistic influences between

the effects of calcium and certain other elements. Yet it would appear probable that a balance of these elements is absolutely necessary for correct plant functioning, in spite of such apparent antagonism: *e.g.*, potassium salts in simple solution are not absorbed by the plant, but if a soluble calcium salt is added both calcium and potassium are absorbed. The plant requires both.

The source of calcium for herbivorous animals has been indicated. Birds require and utilize calcium carbonate (from powdered oyster shells and similar sources) and obviously the egg-shell, almost pure calcium carbonate, suggests the need for such an additional supply. Table I shows the availability of calcium in man's food. (This has been modified and abbreviated from Carter, Howe and Mason's "Nutrition and Clinical Dietetics".)

TABLE I.

Calcium content of food in percentage of edible portion

Hard cheese	0.8
Cottage cheese, almonds	0.2
Dried beans	0.16
Egg yolk	0.14
Whole milk, cauliflower, olives	0.12
Buttermilk	0.11
Peanuts	0.10
Oatmeal, lentils	0.09
Walnuts	0.08
Celery, dates	0.07
Whole eggs, spinach	0.06
Spring beans, carrots	0.05
Wheat, oranges, rhubarb	0.04
Lemons, lettuce, radish	0.035
Asparagus, green peas, whole wheat bread	0.03
White wheat bread, beet, cherries	0.02
Pearl barley, sweet potato, wheat flour	0.018
Squash, tomato, prunes	0.014
Potato, cornmeal	0.010
Fish	0.01—0.006
Meat	0.007—0.002

Man's daily requirement of calcium is between 0.4 and 0.8 gram per day. The latter figure can be regarded as allowing the necessary margin for safety. On account of bone formation the young child requires much more, relatively, and actually a little more, the greater demand lasting until growth is complete. Animals have similar requirements. The non-pregnant, non-lactating pig or goat can be kept in calcium equilibrium on about 0.3 gram per day per one hundred pounds of body weight.

Our food contains calcium in both organic and inorganic combination. It is probable that digestive changes convert it entirely into the inorganic form, so that it is absorbed from the small intestine as a mixture of inorganic salts and calcium ions. Some part in the intestine may be reconverted by interaction with car-

bonates of the digestive juices into insoluble calcium carbonate, and pass through the canal unabsorbed, whence an excess in the diet is desirable.

We excrete calcium in the urine, to a somewhat less extent in the bile, and to a much greater extent through the intestinal mucus. Urine calcium therefore gives no clue as to the amount of calcium absorbed, nor does the calcium of the faeces to the amount unabsorbed. Numerous experimental data dealing with relative absorption, and published even in recent years, are vitiated through neglect to consider these facts of excretion.

The distribution of calcium in animals can be most conveniently considered in relation to:

A. Supporting or protective tissues—bones of vertebrates, shells of invertebrates, secreted tubes of marine worms. For convenience, there will also be included in this group the shells of eggs.

B. The circulating fluids of the body.

C. Tissues other than those included under A.

The first group will be dealt with last. The evidence is almost conclusive that the red cells of the blood contain no calcium. At the most, but minute traces can be present; further, the envelope of the red cell does not appear to be permeable to calcium.

Of recent years there has become available a simple method for the estimation of calcium in small amounts of blood and similar fluids. It was introduced simultaneously by De Waard in Europe and by Kramer and Tisdall on this continent, and consists essentially in the precipitation of calcium as oxalate, and then solution of this oxalate in sulphuric acid, and titration against dilute permanganate. This, with ordinary care, gives results entirely satisfactory for clinical purposes with 2 c.c. of serum or plasma, and with great care, accuracy within 2 or 3 per cent with similar small amounts of material.

With this method it has been possible to demonstrate that the plasma- or serum-calcium content of mammalian blood is fairly constant. In man—at any rate in temperate climates—it varies between 10 and 11 mg. per 100 c.c., and in other animals it does not greatly transgress these limits. In the cerebrospinal fluid the figure is only 5 to 6 mg. per 100 c.c., and in agreement with this difference it has been found that serum and plasma calcium is but little more than half diffusible. It is obvious therefore that calcium is present in blood plasma in more than one form, and, since somewhat less than half of it will not diffuse through

an animal membrane, that portion must be combined in some large kind of molecule, for non-diffusible compounds all possess large molecules. Actually, we believe that calcium exists in blood plasma in some such combinations as these:

Calcium in organic combination, non-diffusible	about 5 mg. per 100 c.c.
CaHPO_4 , $\text{Ca}(\text{HCO}_3)_2$, traces of other unionized calcium salts, all diffusible	about 3.5 mg. per 100 c.c.
Calcium ions, diffusible	about 2.5 mg. per 100 c.c.

It is the diffusible portion which is present in the cerebrospinal fluid. Complex physico-chemical methods are necessary to determine the actual amount of calcium *ions* present, *i.e.*, calcium atoms not united with acid radicals, but carrying a double electric charge (through loss of two electrons), and which are, in virtue of this electric charge, chemically active. The cerebrospinal fluid has a similar or identical calcium ion content to that of the plasma (2.5 mg. per 100 c.c.).

With the exception of such tissues and secretions as are included in Group A the tissues of the body contain amounts of calcium of the same order as the blood plasma. This is exemplified by Magnus-Levy's results for man (in Table II).

TABLE II.
*Distribution of calcium in human tissue after
Magnus-Levy: mg. per 100 gm.*

Thyroid	33.7
Kidneys	19.2
Lungs	16.8
Pancreas	15.9
Intestine	13.5
Salivary Gland	13.1
Brain	10.5
Spleen	9.3
Testes	8.3
Heart	7.9
Liver	7.2
Muscle	6.5

Although some of the figures (as those for thyroid) are questionable, and more recent analyses for human tissue are lacking, though desirable, yet we shall not be far from the truth if we assert that calcium is distributed evenly throughout the body tissues, with the exception of bone. The corresponding figure for bone is about 10,000 mg.

In considering bony tissues it is illuminating to consider at the same time the shells of marine and land invertebrates and similar protective secretions, and it is convenient also to discuss the egg-shells of birds and reptiles.

While the mineral constituents of bone consist chiefly of calcium phosphate (four-fifths), with a little calcium carbonate, and much less magnesium phosphate, those of the shells and other secretions consist almost entirely of calcium carbonate. But some magnesium is present in all marine invertebrate shells and worm tubes, and at least traces of phosphate are invariably present. There is good ground for belief that the presence of phosphate is absolutely essential for both shell and bone formation, and that either calcium phosphate, or a calcium carbonate-phosphate complex, is initially formed, the latter being laid down in osteoid tissue as bone, and changed after secretion by the mantle cells of the invertebrates to calcium carbonate, deposited first in amorphous form, and subsequently crystallizing to aragonite or calcite. In all probability the egg-shell is secreted in some corresponding fashion. All writers agree that mere calcium lack in diet of birds is not responsible for the shell-less egg. In no case therefore does there appear to be a simple precipitation of an insoluble calcium salt or salt mixture.

It may be noted here, that there is experimental evidence that the shell of the egg can be dissolved by the carbonic acid produced by the growing embryo, to yield a soluble calcium salt for the needs of that embryo; 80 per cent or more of its calcium requirements are provided from the shell. The hen, on deficient calcium diet, can draw on its skeleton for the calcium of the egg-shell for some months. The skeleton of the cow, and presumably of other mammals, can equally be drawn upon, not only for the skeletal needs of the foetus where there is a dietary deficiency of calcium, but, apparently often as a normal procedure, in the production of milk. Frequently, if not invariably after prolonged lactation, the cow has been considerably depleted of body calcium, *i.e.*, of bone calcium, since bone is the only considerable reservoir of the element. Meigs has shown recently that a cow during 133 days lactation lost 1300 grams of calcium, estimated at 19 per cent of its total body calcium, the loss being continuous; the milk output was about twenty pounds per day. There is, correspondingly, marked storage during the dry period. Sherman and McLeod have shown that during pregnancy and lactation of the rat there

is a 10 per cent loss of total body calcium, regained in intervening periods. Probably bearing on this point is the observation of these authors that the young, virgin, female rat contains in its body more calcium than males of the same age, and the similar earlier observation of Reach for mice, and the results of Hammett that the calcium content of the humerus and femur of the virgin female rat is always relatively greater than that of the corresponding bones of the male. (The frequency of osteomalacia amongst child-bearing women in China is probably associated with abnormal drainage of calcium from the system on a restricted calcium diet.)

It is perhaps not sufficiently emphasized that the skeleton of the mammal is not only a supporting structure, but is also a reservoir of calcium and phosphate. Calcium can not only easily be laid down in the skeleton, but is easily removed. Bone minerals are in a state of flux, being continuously removed, and renewed, and not once and for all laid down and fixed.

Cow's milk averages 120 mg. of calcium per 100 c.c. Human milk varies from 30 to 80 and averages 42 mg. Yet even the 30 mg. represents a considerable concentration of calcium from the 11 mg. in the blood plasma—a concentration effected by the mammary glands. The calcium in milk is roughly equally divided between organic and inorganic combination, the organic compound, calcium caseinogenate, being non-diffusible. The inorganic constituents consist chiefly of calcium hydrogen phosphate, some bicarbonate, citrate, and calcium ions. There is therefore some degree of parallelism between the calcium content of milk and of the blood plasma from which it has been secreted. Calcium salts given by mouth, or intravenously, to a lactating animal do not increase the calcium content of the milk.

FUNCTIONS OF CALCIUM IN THE BODY

What are the functions of calcium in the living organism?

In the first place, the calcium ions of the blood form part of a balanced system of ions, which, mirrored in a similar balance in the tissues, conditions the degree of irritability of all the muscle and nerve tissue of the body, and in this way controls the correct functioning of the beating heart, the contracting muscle,

the functioning nerve. The complexity of this system is probably great, but, following McClendon, it can be represented approximately in the simple ratio:

$$\frac{\text{Concentration of sodium ions plus that of potassium ions plus that of hydroxyl ions}}{\text{Concentration of calcium ions plus that of magnesium ions plus that of hydrogen ions}}$$

While each of these may antagonize, or supplement the action of one or more of the others, the essence of their correct action is the balance between them.

Increase of any factor in the upper line, or decrease of any factor in the lower line, will increase the excitability of the tissue where such change takes place; if the change occurs initially in the blood, corresponding changes with their effects will follow in the tissues. Increase of any factor in the lower line, or decrease in the upper, will diminish the excitability. Calcium ions therefore play an important rôle in depressing the excitability—lessening the irritability—of the tissues containing them.

Through changes in the ratio, various other body functions may be modified; diuresis or œdema may be produced, actions of various drugs such as adrenaline or pituitrin lessened or accentuated, and even carbohydrate metabolism may be affected. The adumbrations of a disturbance of this equilibrium are far-reaching.

In the second place, calcium plays an important part in the coagulation of the blood. It is of course a truism that if blood did not clot the merest scratch must prove fatal. The theories of blood clotting are steadily becoming more complex (and probably therefore further away from the truth). We may, however, assume roughly that the essential process is the conversion of a protein derivative, prothrombin, into a similar compound, thrombin, through the removal of some unknown antagonizing influence by the phosphatide cephalin liberated from platelets or damaged tissue, and the immediate union of thrombin with the globulin fibrinogen to form insoluble fibrin, which, meshing the red cells, so clots the blood. Calcium plays a definite rôle in the process. We do not know whether prothrombin contains it, but calcium ions are necessary for the formation of thrombin. Thrombin is usually stated to contain no calcium, but a specimen of

thrombin given me recently by Dr. M. S. Hollenberg, prepared by him by Howell's method from cat's blood, and stated to be very pure, we found to contain 0.72 per cent, a figure too great to be an error unless there was gross contamination. In the reaction between thrombin and fibrinogen the former gives up its calcium to the serum, which contains all the blood calcium.

Any treatment which depletes the blood of calcium ions, such as oxalation, or citration, prevents clotting. The delayed clotting time in jaundice seems referable to removal of or depression of calcium ions by union with bile salts. The delayed clotting time in hæmophilia may be due to a variation of any one of the factors concerned in clotting. There is not, usually, a calcium deficiency, though it has occasionally been reported. The beneficial results obtained in cases with no calcium deficiency following intravenous injection of calcium chloride are not easily explained from our present knowledge of the process of coagulation, especially since addition of calcium chloride to blood *in vitro* certainly does not accelerate, and may even retard clotting.

The clotting of milk, indispensable for infant nutrition, and requiring only such a slight degree of acidity that it takes place before the gastric contents are appreciably acidified, would seem to be much simpler than that of blood, though for it also calcium ions are necessary, combining with the casein, hydrolysed from caseinogen by rennin, to form insoluble calcium caseinate, the clot mesh.

Fourthly, the insolubility of certain calcium salts renders them useful as supporting and protecting structures. We do not know why the particular complex of calcium, magnesium, phosphate, carbonate, and fluoride is so efficient in the skeleton, and with slight changes in ratio, in different parts of teeth, though there is some evidence that an increase in carbonate makes for greater hardness; the

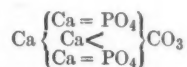
same is probably true for an increase in fluoride (which is present in greatest amount in the enamel of teeth), and it has been stated that an increase in magnesium makes certain marine shell structures more compact.

NORMAL AND PATHOLOGICAL CALCIFICATION

By what subtle chemical processes are the mineral parts of bone so moulded for infinite time that Sir Thomas Browne could write "Now since these dead bones have already outlasted the living ones of Methuselah, and in a yard underground and thin walls of clay outworn all the strong and specious buildings above it; and quietly rested under the drums and tramlings of three conquests"; and elsewhere, "teeth, bones, and hair give the most lasting defiance to corruption." We cannot make such dry bones speak to tell the secret of their "diuturnity", and can yet but dimly grasp their nature.

Dry bone contains between 50 and 65 per cent of mineral matter, laid down regularly in osteoid tissue. Under normal conditions the proportion is very constant; during lactation, and in certain pathological conditions it may fall considerably. The composition of the mineral constituents is shown in Table III, modified from Wells; it includes also figures for various calcified concretions from other tissues.

In addition slight traces of fluoride, and perhaps of other constituents, are present. It is usually considered that these constituents form no mere mixture, but are united to some complex structure of the type represented by the formula:



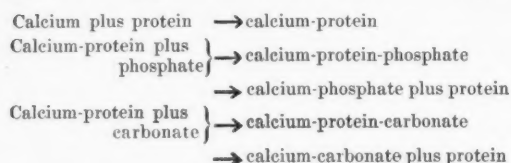
Many theories have been propounded to explain bone formation. The idea that there are complex calcium carbonate-phosphate molecules in the blood, which are merely deposited in the osteoid tissue, may be rejected. It seems

TABLE III.
Mineral Composition of Calcified Tissues

	Ca	Mg	PO ₄	CO ₃
<i>Normal ossification</i>				
Human bone	36.1-39.1	0.29-0.48	52.2-55.1	5.5-7.7
Ox bone	38.0-38.1	0.28-0.42	53.2-53.9	7.1
<i>Pathological calcification</i>				
Bovine tuberculosis	37.8-38.6	0.23-0.33	52.9-53.9	7.0-7.9
Human tuberculosis	38.0	0.33	54.7	6.1
Calcified nodule in thyroid	38.5	0.23	52.9	8.0
Human thrombus	38.3	0.30	53.8	7.1

agreed that bone formation is no mere precipitation of insoluble inorganic salts in a receptive matrix. Various studies have been made with mixtures of carbonates, phosphates, and calcium salts, and undoubtedly when these react in a colloid medium the mode of solid formation appears to approximate to that in bone.

The theory of Rona and Takahashi, while probably not completely correct, suggests what may be the type of action when bone is formed.



This theory assumes that some protein plays a specific rôle in bringing together the necessary inorganic ions. As we shall see shortly, a vitamin plays a large part in keeping the blood concentration of these ions sufficiently high to permit their necessary interaction. If this vitamin is deficient, interaction is deficient, and rickets results. The internal secretion of the parathyroid is another factor which determines the concentration of the calcium ions in the blood. Robison has recently made the interesting observation that osteoid tissue—and only osteoid tissue—contains a specific enzyme which will hydrolyse hexose-phosphates; as the result of this action the concentration of inorganic phosphate will be increased at the very place where the interaction between calcium and phosphate is to take place, and the observation suggests that a local excess of phosphate is necessary for the action.

I have already emphasized the fluidity of our bony framework. Any drain of calcium from the blood is at once responded to by solution of bone. The drain upon the mother during lactation has been dealt with. The potential drain upon the mother during pregnancy is shown by the fact that at birth the blood of the new-born child contains a little more calcium than that of the adult, while that of the mother contains a little less. The differences in inorganic phosphate are a little greater, 5 mg. of phosphate-phosphorus in the infant per 100 c.c. plasma, 3 mg. in the adult. Thus where bone formation is most rapid the body fluid contains the highest concentration of the necessary ingredients. These only slowly fall to normal with increasing age.

The growing foetus distrains these ingredients from the mother to her possible detriment ("for every child a tooth"). There must be some governing factor which determines the balance in favour of the foetus. We shall see that it may be the parathyroid gland.

The ease of solution of bone is perhaps also illustrated by some experiments that I carried out some time ago at the suggestion of Dr. Alexander Gibson. Calcium carbonate passes appreciably into solution in Locke's solution at a degree of alkalinity corresponding to that of the blood. Any decrease of this alkalinity produced by addition of lactic acid materially increases the amount of calcium passing into solution. This change is effected also in presence of phosphate ions.

Holt, with La Mer and Bruce Chown, has recently published a series of important papers dealing with the physical chemistry of calcium phosphate solutions, from which Holt concludes that the blood serum is to be regarded as a supersaturated solution of tertiary calcium phosphate, the latter being prevented from precipitation by some undetermined factor. I do not think that he has, in these researches, sufficiently considered the carbonate factor, and the complex ionic balance.

Wherever there is necrosed or diseased tissue there may be the possibility of calcification. This is especially exemplified by the tubercle follicle. It has therefore been suggested that calcification of the tubercle is a means adopted by the organism to combat the disease. This is to put the cart before the horse. The process is mechanical. Some condition in the pathological mass favours calcification, and calcification occurs. The presence of a great mass of solid calcium salts of definite composition (in the skeleton) bathed by the same fluid, inevitably results in bringing the new calcified mass to the same composition (as is exemplified in Table III). This mechanical process resulting in the calcified tubercle, and in calcified nodules in various tissues, such as old empyema, hydrocele sacs, atheromatous blood vessels, can, I think, justly be compared with the mechanical formation of the pearl in the oyster round some focus of irritation.

Where hypercalcification occurs, as in sclerosis of the ends of bones, or at the site of an ununited fracture, or in the so-called "marble bones" we can only suppose at present that there is some local exaggeration of the factors leading to mineral deposition.

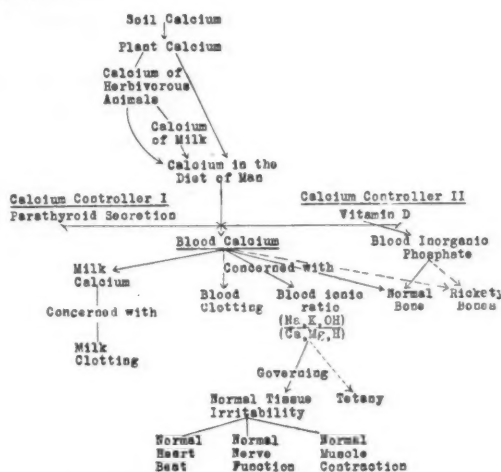
Fractures.—The slight elevation of plasma

calcium of the nursling soon drops to the normal figure of the adult; the high inorganic phosphate figure also falls, but more slowly. Several independent observers have recorded that during the normal healing of fractured bones, while the plasma calcium remains unaltered, the inorganic phosphate rises towards the maximum figure of childhood—of maximum bone formation. One might naturally suppose therefore, that with non-healing fractures such a rise would not take place, but one observer records this rise for the pathological condition also. The chemical changes following fracture seem to deserve further study.

Conclusion

Someone has said that if we knew the whole truth about anything we should know the whole truth about everything. The far-reaching involutions which this one subject exemplifies—and space has necessitated omitting many pertinent digressions—indicate a solid foundation for such a statement. Yet though we can but see through the glass darkly we can already trace out certain patterns, and we may confidently hope that further intensified work will enable us

to trace so many more that we shall be able to comprehend the design underlying this phase of life, even though we cannot fill in the complete picture.



This review is based on more than a thousand papers published within the last twenty years. Any short bibliography would therefore be invidious. The main facts which I have endeavoured to present are summarized in the above chart.

THE PRACTICAL APPLICATION OF OUR PRESENT KNOWLEDGE OF CALCIUM METABOLISM*

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DISEASES ASSOCIATED WITH DEFICIENT OSSIFICATION

THE most outstanding of these diseases is infantile rickets. Adult rickets (rachitis tarda) and osteomalacia, and perhaps some other pathological bone conditions, not improbably arise from the same or similar causes, governed by a changed reaction to such abnormal stimuli in the adult, as compared with the young bone cell. Not only bone, but teeth, may be affected by whatever influences calcification.

* Being Part II of an address on "The Biochemistry of Calcium."

During even the past few years the suggested etiologies of rickets have been very numerous. The following causes have been suggested:

Modification of the physio-chemical condition of the mineral constituents of the body; acidosis; malnutrition leading to acidosis; an improper dietary regimen; over-nutrition; phosphate deficiency; phosphate and vitamin deficiency; incorrect calcium phosphate ratio in the diet combined with vitamin deficiency; calcium deficiency; bacterial agency; pancreatic lesions leading to poor production and absorption of fatty acids, and therefore poor absorption of calcium; disturbance of phosphatide metabolism through liver deficiency; adrenal involvement; incapacity of the bone to assimilate calcium; defective hygiene; lack of fresh air, sunlight, and exercise.

Such a large amount of excellent work has now been accomplished, that it is possible to

give at the present time a reasonably accurate statement of the causes leading to rickets and the best curative methods available, and even to reconcile a number of the apparently conflicting etiologies that have been suggested. Some are obviously fantastic.

To Edward Mellanby belongs the distinction of insisting that rickets is a vitamin-deficiency disease, and to E. V. McCollum and his co-workers are largely due our thanks for the present accurate knowledge we possess. Their studies have led to the identification of a new vitamin, *fat-soluble D*, which is present in especially large amount in cod liver oil (also one of the chief sources of vitamin A). Hess has fractionated the oil, and obtained a non-zaponifiable fraction soluble in acetone which is a thousand times more active than the original oil, and which is quite free from vitamin A, that compound whose deficiency leads to the eye condition xerophthalmia. Butter contains much less of the new vitamin than does cod liver oil, milk a sufficiency for prevention, but not for cure of rickets, while egg-yolk is fairly rich in it. Of animal tissues bone-marrow is stated to be especially rich in it. It is not elaborated in the germinating seed as are several of the other vitamins.

Rickets, characterized by an incorrect and deficient calcification of bone tissue, can be produced in the young growing animal either by deficiency of calcium, or of phosphate, or of vitamin D. in the diet. In the presence of an ample amount of the vitamin much smaller amounts of calcium and phosphate are sufficient to prevent rickets than when there is only a small quantity of D present. It conserves these mineral constituents to the body. In rickets there is found low serum calcium—as low as 6 mg. per 100 c.c. in extreme cases—along with somewhat low serum inorganic phosphate, or low phosphate with normal calcium. In the former case the rickets may be accompanied by tetany. In rickets also there tends to be a negative calcium and phosphorus balance, owing to a continued loss of these elements from the body. In the normal growing child, bone requirements demand a marked calcium and phosphorus retention.

Any digestive derangement which may upset the acid-base equilibrium may possibly, by affecting absorption of calcium and phosphates,

lead to rickets. Acidosis is a frequent, if not an invariable accompaniment, and since acetone bodies are absent, it may be attributed to a mineral derangement. (On the other hand it has been stated, though we need not believe the statement, that hydrochloric acid therapy will cure rickets.) Incorrect dietary of the mother is probably a large contributory factor in nurslings. An ample dietary for her as regards calcium, phosphates and vitamin D will certainly help to prevent the onset of rickets in her nursing even for some time after weaning.

Rickets can be cured by cod liver oil, and by ultraviolet light of wave-length, between 2,200 and 3,000 Å.u., from any powerful source, such as the quartz mercury vapour lamp, or even the open carbon arc light. Such treatment brings back the deficient plasma calcium and inorganic phosphate to normal level, and converts a negative calcium and phosphorus balance to a positive one, while the mineral content of the bones increases. Direct sunlight contains sufficient of the ultraviolet rays to prevent onset of rickets, though perhaps not so readily to effect a cure. Experiments with English sunlight have had less curative success, apparently, than similar ones on this continent. (Clover hay made by exposure to sunlight is active; made in the dark it is inactive.)

The curative effects of the ultraviolet rays can be produced by directly raying the child, or by raying a large number of different compounds and food mixtures which are subsequently fed. Such include the important complex alcohol *cholesterol*, and the related plant *phytosterols*, and it seems extremely probable that the foodstuffs which can become activated all contain cholesterol or related *sterols*. Vitamin D is not cholesterol, but is probably a related sterol. The rayed substance retains its anti-rachitic potency for several months, but apparently over-ricing again changes it to an inactive modification.*

* It has even been stated that raying cages prevents onset of rickets in rats on a rickets-producing diet subsequently placed in them; that the presence in the same cage of rayed rats will also act as a preventive. These claims have a simple explanation. The rayed cages contained faeces which were therefore rayed; the rayed rats dropped faeces. These faeces, containing activated *coprosterol* (derived from cholesterol), were eaten by the experimental animals, and prevented the onset of rickets in them. Such observations emphasize the minuteness of the amount of active substance that is required by the organism. Livers, muscle, and lung tissue from rayed rats are active in preventing rickets.

It thus appears that there are a series of substances related chemically to vitamin D, which are capable of taking on its activity when treated with certain rays of short wave-length, and that the vitamin, or these substitutes, in some way controls calcium and phosphate metabolism, effecting that normal concentration in the blood, and therefore in the tissues, requisite to permit the normal calcification of osteoid tissue.

Röntgen rays and radium will not activate these substances, and will not cure rickets. Ultraviolet light neither prevents nor cures xerophthalmia, and is therefore not a substitute for vitamin A.

In this climate its wealth of sunshine obviously affords the best and cheapest preventive. When rickets is in being, crude cod liver oil is the best and cheapest curative agent. Both for prevention and cure reasonably balanced diets containing sufficient calcium and phosphate are necessary adjuncts. While rayed products are of great interest scientifically, until such time as they are standardized, and cost less than the corresponding effective dose of crude cod-liver oil, their therapeutic use is unjustified.

TETANY

One variant of rickets is accompanied by tetany, or latent tetany. It is natural to consider next, therefore, what is at present known of this disease, or, more accurately, this manifestation of disease. Tetany, essentially a hyperexcitability of the nerve-muscle system, occurs in the following conditions: rickets with tetany; infantile tetany of unknown origin; parathyroid deficiency through surgical or other causes; excessive thyroid feeding in rats; overventilation of the lungs; feeding or injection of sodium or potassium phosphate; feeding or injection of large amounts of sodium carbonate or bicarbonate, (and perhaps of other sodium salts); pyloric stenosis or similar conditions in which large amounts of hydrochloric acid are removed by vomiting or gastric lavage; occasionally in severe diarrhoea; following injection of guanidine or methyl guanidine.

We have seen that the normal degree of muscle and nerve excitability depends upon a balance of certain ions; an increase of sodium, of potassium, or of hydroxyl ions, and a decrease of calcium, of magnesium, or of hydrogen ions

leads to greater irritability. It is necessary to consider whether a disturbance in the ratio of these ions will account for the production of tetany in the above widely varying conditions. If such increases or decreases as those mentioned can be demonstrated, then the stage will have been set in the blood and the tissues bathed by it for the production of tetanic spasms by stimuli which ordinarily have no influence on the organism. Our knowledge of the distribution of these ions in the blood in these different conditions is not yet complete, but is sufficiently extensive to enable fairly accurate conclusions to be drawn.

In rickets with tetany, and in most other infantile tetanias serum calcium is decreased, frequently to 5 or 6 mg. per 100 c.c., and sometimes even lower. Sodium and magnesium remain normal; there may be a slight increase in serum potassium. Administration of calcium or magnesium salts is temporarily beneficial, as is also the administration of hydrochloric acid-milk, and anything such as ammonium chloride which will tend to produce an acidosis. Cod liver oil and ultraviolet light are beneficial, raising the serum calcium to normal. Thus the main constant factor, appears to be a calcium deficiency, which can be counterbalanced by increasing calcium directly or indirectly, or by increasing the hydrogen ion concentration.

A certain percentage of cases of infantile tetany seem to possess normal serum calcium, and to be due to an acid-base disturbance, presumably of digestive origin, and which leads to an alkalosis—an increase of hydroxyl ions in the tissues.

Parathyroid deficiency leads primarily to lowered serum calcium (which may fall to 4 mg. per 100 c.c.) accompanied secondarily by an alkalosis, which, during acute, severe attacks may give place to an acidosis. This may be due to excessive production of lactic acid through excessive muscular contraction. Calcium salts, injected or given orally, are temporarily beneficial. So are those of magnesium, and of the related element strontium.

On the other hand over-ventilation of the lungs leads to no lowering of serum calcium, perhaps even to a slight increase, but, through the rapid removal of carbon dioxide from blood and tissues, a tissue alkalosis is produced. Increase in the concentration of hydroxyl ions is therefore the determining factor.

As I shall show, in a paper to be shortly published, thyroid feeding produces in young rats a lowering of blood calcium, presumably due to parathyroid deficiency produced mechanically by diminished blood circulation to the thyroid-parathyroid apparatus; this is occasionally supplemented by an alkalosis resulting from the slightly increased respiration of anoxæmia due to lowering of oxygen tension from decreased barometric pressure, increased temperature and humidity, with resulting tetany. Such combined causes probably explain the increased occurrence of tetany during the so-called "tetany months" in continental Europe.

Sodium or potassium phosphate not only leads to a slight increase of the metallic ion concerned, but further to a diminution of serum calcium, which may fall as low as 6 mg. per 100 c.c., the ionic calcium being also lowered, and so tetany is doubly provoked. If phosphoric acid is employed instead of its salts the serum calcium is lowered, but tetany does not ensue; the calcium fall is compensated for by the increase in hydrogen ions.

Sodium bicarbonate and carbonate act not only through the increase of sodium ions, but also through the alkalosis produced.

Loss of hydrochloric acid by vomiting also leads to an alkalosis, and so to tetany. In severe diarrhoea some similar acid-base upset may well be imagined.

It is doubtful whether injection of guanidine or methyl guanidine leads to any change in serum calcium. It has been suggested that the intermediate effect is strong lung ventilation, and hence an alkalosis.

Thus it would appear that in all of the above conditions that lead to tetany its onset can be satisfactorily explained by a disturbance of the ionic ratio that governs muscle-nerve irritability. Most infantile tetanics, parathyroid insufficiency, and the tetany following sodium phosphate injection are definitely associated with a lowering of the blood serum calcium concentration. The others seem largely due to an increase in the hydroxyl ion concentration. I wish to emphasize, however, the probability that *these tetanics result frequently from a combination of factors.*

The tetany associated with guanidine, is in my belief, purely a pharmacological effect, not met with in ordinary pathological conditions; it has been associated, by those who think otherwise, with the normal metabolism of calcium through a hypothetical detoxication function of the parathyroid glands.

THE FUNCTION OF THE PARATHYROIDS

The association of parathyroid deficiency with lowering of serum calcium naturally suggests a relationship between calcium metabolism and parathyroid function. A step towards demonstrating this was made by Hanson in 1924. A far greater forward step was made by Collip in 1925; he succeeded in preparing a concentrated solution of the internal secretion of the parathyroid, and determining its most important properties. Hjort, Robison and Tendick have confirmed his method of preparation; Fisher and Berman have prepared similar concentrated extracts. Numerous investigators have confirmed the results obtained with Collip's extract.

Collip has shown that the concentrated product of the acid hydrolysis of parathyroid glands, injected into animals in severe tetany following parathyroidectomy, quickly restores them to normal condition, at the same time raising their plasma calcium to normal level, and holding it there longer than the administration of calcium salts can do, whether these

be given by mouth or injected. Such animals can be kept free from tetany for months, though, if injection of the extract be stopped, tetany recurs within a day or two.

If the injection be given in large doses and at repeated short intervals the calcium of the blood is increased much above the normal level. When it is about twice normal other symptoms intervene, atonia, profound depression, anorexia, ataxia, vomiting, bloody stools, etc., and ultimately the animal dies. The same increased blood calcium, and ultimately fatal ending, follow injections of the extract into the normal animal. So far no antidote has been found for these effects from over-dosage; evidently chemical control must at present be employed during the administration of the extract in clinical cases.

These results have been confirmed by J. J. R. Macleod and many others, including Moorhouse and myself. We have shown that both the diffusible and the non-diffusible calcium are raised by this treatment—to approximately an equal extent—just as they are both lowered following parathyroidectomy.

Not many results have as yet been published with clinical cases. Collip and Leitch obtained satisfactory results with a girl of twenty-two months, a pronounced case of rickets which suddenly developed tetany. Crile has reported relief from tetany symptoms in a number of cases of acute and chronic tetany. Davidson kept a girl suffering from thyroid and parathyroid deficiency free from tetany and myxoedema for many months by combined thyroid and parathyroid treatment. Lissner and Shepardson controlled the tetany following an accidental parathyroidectomy accompanying a thyroidectomy. We are at present studying a similar case, and have obtained good results. Mason has reported excellent results from treatment of a case of chronic nephritis with the extract, the results following re-adjustment of the blood calcium to normal.

The last is the first definite report of benefit in cases where the pathological changes in the blood calcium are not of parathyroid origin. It seems doubtful whether the extract will prove of value in such cases as delayed union of fractures.

THE GENERAL CONTROL OF BLOOD CALCIUM

From our studies with parathyroidectomized

dogs Moorhouse and myself have put forward a theory of the mechanism by which the blood calcium is maintained at a constant level; the results we have obtained with Collip's extract appear to afford support. Greenwald has criticized the experimental basis of this theory, but, on other data, has himself adopted a similar one.

We believe that the parathyroids elaborate an internal secretion which controls the formation of a non-diffusible calcium compound in the blood, and that this, by a series of interlocked equilibria, keeps the diffusible calcium compounds of the blood to a constant ratio with itself. If the parathyroids function normally, the compound under their control will be kept at constant concentration and therefore the total blood calcium will remain constant. The slightly higher value for the plasma calcium of infants' blood suggests a more active parathyroid function.

This theory, to be complete, must take into account the further control by vitamin D. We have seen that administration of cod liver oil or of ultraviolet light restores blood calcium to normal in the rickety child with deficient blood calcium. We have as yet no evidence to determine the nature of this control, though it seems to be closely interwoven with that of inorganic phosphate. The proof that Swingle has recently given us that the effect of bleeding parathyroidectomized animals is to restore blood calcium transiently to normal value, suggests, since we may assume that these animals were not also suffering from a deficiency of vitamin D, that the latter in some way controls the height of calcium at blood formation, while the secretion of the parathyroids maintains the balance between the different calcium combinations. We require further experimental data.

THE EFFECT OF CALCIUM ADMINISTRATION

When calcium salts are given by mouth, or injected, it has been recognized for some time that there is merely a most transient effect on the height of blood calcium. Hjort on this continent, and Astanin in Russia, published independently last year accurate studies which give a clear idea of the effect on the blood, and its duration. Hjort's experiments on dogs show that heavy single doses of calcium lactate—

corresponding to 100 gram doses for an adult man—when given by mouth raise the blood serum calcium of normal animals three or four milligrams per 100 c.c. for three or four hours. When similar doses are given to dogs in marked tetany following parathyroid removal the calcium is raised above the danger point for only a similarly short period. Half the dose gave uncertain results. Calcium chloride was similarly effective, *if retained*, but the heavy dose usually produced vomiting. Calcium glycerophosphate in similar dosage was much less effective. Astanin's results from intravenous injections of these salts into rabbits indicate an even more transient effect.

When such excessive doses only produce such temporary benefit we can easily understand why therapeutic doses can lead only to very transient results. Evidently, the most we can hope for is continued slight benefit from moderate doses given at *frequent* intervals.

Where does the excess of calcium go to? It may be in part excreted, but it would seem in large part to be deposited in the tissues, especially the bones.

Greenwald has found that after parathyroid removal there is a similar disappearance of calcium, following its administration, though whether it is excreted or deposited in the tissues seems, according to observations of Underhill, to be conditioned by the calcium nutrition of the subject.

Continued excessive doses of calcium salts to normal animals are followed by loss of muscle tonus, then paralysis. A curious result of prolonged administration of calcium chloride to a healthy man on salt-free diet was reported by Lemièrre in 1922. He lost weight, and became depressed, mentally and physically. The calcium chloride was stopped and sodium chloride given. He became exhilarated, and was "salt drunk" for forty-eight hours.

OTHER DISEASED CONDITIONS POSSIBLY RELATED TO ABNORMAL CALCIUM METABOLISM

Numerous attempts have been made to associate tuberculosis with a disturbed calcium metabolism. Accurate workers seem to be agreed that no such disturbance is involved (unless, of course, bony tissue is affected), and that administration of calcium salts is of no benefit, calcification being a secondary process to the disease, influenced by local tissue changes—perhaps fatty degeneration.

Besides a proportion of the cases of rickets, and cases involving parathyroid deficiency, low plasma calcium is known to occur in severe

nephritis, with and without uræmia, and with and without heart insufficiency, and also, to some extent (accompanied by retention) in pneumonia. This type of lowering is usually not accompanied by tetany; the ionic balance is not sufficiently disturbed.

Other conditions in which slight lowering of serum calcium has been reported are hæmatogenous jaundice, dysentery, certain asthmas, sprue, furunculosis, and a small percentage of the hæmophilias. (Ashford and Hernández have just published an excellent paper on calcium deficiency in sprue and in nutritional unbalance in Porto Rico, in which they have thrown grave doubt on the claims of Vines and Scott that administration of parathyroid is beneficial in sprue).

High calcium figures have been reported for severe acne, a case of myositis ossificans, and very high values averaging 19 mg. per 100 c.c. (Coates and Raimont, 1924) for gout. In view of the marked pathological changes which Collip has shown accompany similar high values following repeated injection of his extract these high values for gout appear questionable, but Horowitz has just published (1926) high results for acute gout (the highest value he records is 16.8 mg.). He found that five out of fourteen cases of arthritis deformans with marked deformity showed a value higher than normal, the maximum value for this series being 16.2 mg.

Blood calcium in epilepsy is normal. This

condition is not associated with parathyroid deficiency.

Vines and Price claim to have found abnormalities in blood calcium in a variety of conditions, which, they further claim, were benefited by calcium administration. In my opinion their methods are unreliable, and their theory is certainly, chemically, incorrect.

FURTHER PROBLEMS REQUIRING STUDY

Certain other observations in the literature appear to be well worth closer examination. What is the involvement of carbohydrate with calcium metabolism, exemplified by the lowering of sugar tolerance which follows parathyroidectomy (shown by Salvesen), and by apparently some diminution of glycosuria in diabetes following administration of calcium salts, (while someone has stated that continuous alimentary glycosuria in rabbits depletes their bones of calcium)? Why does parathyroid hyperplasia follow disturbance of the calcium-phosphate ratio, or even deficiency of diet calcium? Is there, as some state, a parathyroid enlargement sometimes accompanied by tumours, accompanying certain bone diseases?

The types of parathyroid enlargement separately reported to accompany rickets in chickens, and to follow ultraviolet light treatment, certainly merit attention, since, if such changes do occur, they tend to bring into alignment the actions of vitamin D and of the parathyroid secretion.

With Sir Thomas Browne let me say "These are queries which might enlarge, but must conclude this digression."

A diet that will accelerate growth most amazingly has been worked out by Thomas B. Osborne and Lafayette B. Mendel, of New Haven. White rats used for experiments in dietetics for a dozen years have been bred from the same stock, and they have shown a noticeable increase in the rate of growth. In 1912 a male rat required on the average ninety-four days to reach full weight, while in 1925 the time had been reduced to sixty-seven days. This gain in growth came about unconsciously through the continuous selection of the more vigorous animals. But now the experimenters have found it pos-

sible to reduce the growing period to less than twenty-five days by putting the young rats on a special diet. This ration contains an unusually liberal allowance of protein and a variety of such food materials as lettuce, liver and yeast. These experiments point to the possibility of speeding up the growing process in animals by the double method of developing the hereditary tendency through eugenics and of furnishing such food as will stimulate rapid development. Whether such a forcing process has any deleterious effects on the individual or his progeny remains to be determined.

An Address
ON
ON SOME FORMS OF ANÆMIA

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THE condition known as anæmia is, in the majority of instances, a symptom complex secondary to some well recognized cause. Hæmorrhage is the most obvious, but its association with various bacterial and protozoic infections and with many chronic ailments has long been recognized.

Taken literally the term anæmia applies to all constituents of the blood, but for clinical purposes the diminution in hæmoglobin is the most important and outstanding feature. To a defective quantity of this constituent is due most of the signs and symptoms of the condition. In recent hæmorrhage however the loss of plasma is an important element in the production of shock.

In estimating the degree of anæmia it is assumed that the blood plasma is constant in quantity or nearly so. It is obvious that blood concentrated by recent hæmorrhage or by loss of plasma, as in surgical shock, gives unduly high counts. Both clinicians and physiologists have devoted much time and labour to the blood volume and its relationship to the weight of the individual or animal examined. Welcker in 1854 estimated the blood as one-thirteenth of the body weight and this figure has been accepted as approximately correct since that time. Since then a variety of methods have been introduced which can be applied clinically, and although Lamson and Rosenthal have justly criticized their accuracy, they admit the diagnostic value of a series of observations in determining constant values or variations in different conditions. Although results may vary slightly according to the method used, the blood plasma may be taken as 5 per cent and the corpuscles as 4 per cent of the body weight, whilst the average volume of blood is 85 to 90 c.c. per kilo. Whipple adds 0.2 per cent for the white cells. With a few exceptions to be presently noted the blood

plasma is a fairly constant quantity and changes in blood volume in anæmic states are due to deficiency in the corpuscles.

Although these figures may require modification through further research, they may be taken as approximately accurate and form a useful working basis. Keith and his associates found some notable variations in blood volume, the average in obesity being rather less than three-fourths of the normal. Lea and Whipple confirmed these observations in dogs, fat animals showing a lessened amount of blood in proportion to their weight. In pregnancy the blood volume is increased, probably indicating a protective mechanism against the losses occurring during and after delivery. Concentration of plasma may result from a lack of fluid in the tissues as in starvation from carcinoma of the œsophagus, in which the red cells may rise above the normal count. In shock there is an escape of fluid into the tissues and in acute œdema of the lungs from gas poisoning in soldiers Haldane, Meakins and Priestley found concentration of blood. In general œdema, however, there is no alteration in the relative amount of blood plasma.

We may therefore infer as the result of these observations that the blood plasma in normal individuals and in most morbid states varies only within narrow limits, and that the blood count and hæmoglobin index give a fair indication of the degree of anæmia present.

It is often assumed that the blood corpuscles are evenly distributed in the blood vessels, but it has been shown that there is an axial stream in the arterioles and in contracted capillaries forcing the red cells into the veins at the expense of the plasma. In making counts it is therefore advisable to always draw the blood from the same source, as that from the veins may be as much as 10 per cent higher than that from the capil-

laries. In pernicious anæmia however according to Duke and Stoper the opposite condition is found, higher counts being found in the capillaries.

The cell volume in pernicious anæmia as pointed out by Capps is always greater than for a similar number of corpuscles in other conditions, indicating a larger average size of the cells, and as this occurs in no other circumstances it is of some diagnostic value. The high colour index of pernicious anæmia is due to this increase in volume, and it is never greater than for a similar bulk of normal cells. The average size of the cells in other forms of hæmolytic anæmia is normal or very little less; in anæmia of a chronic type due to hæmorrhage the cells are somewhat reduced in size, the average being about three fourths of the normal.

The degree of oxygen saturation in anæmia is never above normal. Even in pernicious anæmia it is often somewhat below normal whilst secondary anæmias give a lower grade of saturation than the pernicious type. The individual corpuscles do not carry their normal load in anæmia, and are therefore defective in their capacity as oxygen carriers.

Three principal causes may be distinguished which lead to blood impoverishment. The most obvious is direct loss of blood by hæmorrhage; the second is hæmolysis, induced by known or unknown toxins or by phagocytosis in the spleen and bone marrow; the third is due to defective function or disease of the blood-making tissues; the principal one in the adult being the marrow of the flat bones.

The source of hæmorrhage is usually too apparent to escape notice. Small recurring hæmorrhages from piles or a gastric or duodenal ulcer may however, do so, but an examination of the stools reveals its presence to the naked eye or when in small amounts only to chemical tests. In malignant disease or other ulcerative lesions of the intestinal tract the discovery of occult blood is often a valuable clue in the recognition of the morbid process.

Blood destruction or hæmolysis plays an important part in a number of anæmic conditions, and may result from a variety of causes. In infections the degree of anæmia may vary from a mild to an extreme grade as in malaria and in some septic infections. A number of chemical poisons such as benzol, ricin and toluol-diamine

have a similar effect, and their action is aggravated by injury to the bone marrow, thus preventing the delivery of fresh supplies of cells. Unknown toxins are probably the cause of the extreme degrees of anæmia seen in the pernicious form and in hæmolytic jaundice.

The blood corpuscles in all forms of anæmia, with the exception of those in hæmolytic jaundice, are more resistant to hypotonic salt solutions than the normal, and their destruction cannot therefore be attributed to lessened resistance. The recognition of hæmolytic anæmias is facilitated by the presence of a delayed Van den Bergh reaction in the blood, by the increase of urobilinogen in the urine, and by a faint yellow tinge of skin, as seen in pernicious anæmia and severe septic cases. The blood plasma may also have a yellow tinge.

When no evidence of hæmorrhage or of hæmolysis exists, we may put down the anæmia to defective formation of blood. Dickson in his work on bone marrow describes proliferative and fibroid changes, accompanied by a corresponding diminution in the blood forming portions of the marrow as specially characteristic of syphilis; a similar change is found in old and debilitated individuals, and is doubtless largely responsible for anæmia occurring under these conditions. The same author refers to a gelatinous change in the marrow with the gradual disappearance of the blood-forming elements, occurring in a variety of conditions such as tuberculosis, malignant disease, starvation, and in undue activity with subsequent exhaustion as in sepsis. Stockman and Charteris also describe this change after prolonged administration of lead, arsenic and mercury, representing exhaustion after prolonged stimulation. In the rapidly fatal malady known as aplastic anæmia the marrow function is lost and the lack of blood is largely if not exclusively due to destruction of the blood forming elements of the marrow.

Anæmia from hæmorrhage.—With a moderate hæmorrhage in a healthy individual the loss is rapidly made up, but when severe it may take weeks or months before the blood returns to normal. With frequently repeated bleedings, when the intervals are insufficient to allow of regeneration, a chronic anæmia develops, depending not only on loss of blood, but also on exhaustion of the bone marrow and defective for-

mation of blood. It becomes watery, with a low colour index and leucopenia.

Immediately after a hæmorrhage the red cell count and hæmoglobin index are normal and furnish no indication of the quantity of blood lost. As dilution takes place the blood pressure rises, the circulation improves and shock, if present, lessens or disappears. At the same time we have the paradox of general improvement with a falling blood count and hæmoglobin index.

With moderate losses the blood bulk is rapidly made up by absorption of fluid. Keith states he has often found it normal in an hour after drawing as much as 800 c.c. from a donor. From observations on wounded soldiers Govaerts found that the cell count decreased for seventy-two hours, indicating the period during which dilution took place. Robertson and Bock found a diminished blood volume for several days, often eight or nine, with severe blood losses.

The rate of increase in blood volume depends largely on the reserves of fluid in the tissues and Robertson and Bock proved the blood volume increased rapidly when fluid was forced by mouth and rectum, and that this measure was usually required to produce an approximately normal volume. There is again a relationship between the rate of absorption and the total quantity of hæmoglobin. According to Robertson and Bock dilution may fail completely when the total hæmoglobin is in the neighbourhood of 20 per cent, and is incomplete until there is a rise to 40 or 50 per cent. Failure in absorption is a serious sign, indicated by a stationary blood count or hæmoglobin percentage, and in some instances, ending fatally, the vessels lose their power of holding fluid even after transfusion.

Following hæmorrhage there is a marked change in the microscopic characters of the blood. Intense stimulation of the bone marrow results in the formation of a polynuclear leucocytosis, beginning within a few hours of the hæmorrhage and rising to ten, fifteen or twenty thousand and even as high as forty thousand. The platelets increase within the first twenty-four hours and reach a maximum in a few days and attain to as many as a million per c.c. Young red cells represented by normoblasts and reticulated cells are also frequently found in the early days.

Reticulate cells are normally present in about 0.5 to 1 per cent; they show an early increase

to 5 or ten per cent and may reach 25 or 30 per cent. A rise in blood volume is another factor, and this favours the production of reticulated cells so that their presence in considerable numbers is a favourable sign, indicating not only blood regeneration but also an increasing quantity of plasma.

Chlorosis and *pernicious anæmia* bear the time honoured title of primary anæmias, a term which will probably endure until the cause of these ailments is discovered.

Chlorosis so named from the peculiar greenish hue seen in some of the cases, was formerly a rather common disease in hospital wards which were seldom free from an example of the disease. Of late years however the malady has become a rarity, not only in North America but in Europe. This fact may be illustrated from the medical reports of the Montreal General Hospital. In the five year period 1900-1904, 102 cases were treated in the wards. A marked fall began in 1905 and in the five year 1905-1909 there were thirty-one cases, 1910-1914 twenty-three, and 1915-1919 only thirteen, although the hospital beds were almost double those in the first five year period. The disease is limited almost if not exclusively to the female sex and begins from the age of puberty to a few years later, and not infrequently recurs as late as the third decade.

Whilst the blood corpuscles may be normal in number or show only a moderate reduction, not often under three million, the hæmoglobin is relatively reduced in a much larger proportion. Thrombosis in the peripheral veins occasionally occurs; the only fatal case I have seen was due to pulmonary embolism from a thrombus in the femoral vein.

Pernicious anæmia.—In 1855 Addison gave a graphic description of the clinical manifestations of pernicious anæmia and a few years later Biermer described it in detail. Although subjected to much investigation the cause of the disease is still unknown. That it is due to an infection is a view held by many observers. Hunter holds that infections in the mouth of a low inflammatory or septic character are responsible for the malady. There is no doubt however that the disease is seen in individuals with healthy gums and teeth, while in the Johns Hopkins series of 111 cases 60.4 per cent had poor teeth, a figure about the same as that found in the

average hospital patient over middle life.* Herter in 1906 found the *B. Welchii* in increased numbers in the intestines of affected individuals and suggested that they might be a source of infection. Quite recently Kalm and Torrey, after confirming Herter's observation, prepared a toxin from these bacilli which induced symptoms in monkeys highly suggestive of pernicious anæmia. The blood picture was identical in both conditions and an immunity developed, reminiscent of the remissions in pernicious anæmia, but differing from it in being of a permanent character.

The absence of HCl from the gastric juice is one of the most constant signs in pernicious anæmia, and has a possible bearing on the development of the disease. There are numerous cases on record in which achlorhydria preceded anæmia by a period of years. Amongst others Hurst and Bell and Weinberg have recorded cases of this nature. Hurst regards the achlorhydria as an essential feature in the development of the disease; the loss of the acid secretion favouring the development of bacteria, whose toxins are the immediate cause of the condition.

All agree that there is extensive hæmolysis in well developed cases, giving rise to the yellow tinge of skin and increased urobilinuria. In addition there is an extensive deposit of iron in the outer zone of the liver lobules and also in the viscera and bone marrow. Peabody has recently shown that phagocytes in the bone marrow engulf large numbers of red cells, far more than in any other condition, and he regards this feature as possibly being important in the blood destruction.

Whilst blood destruction is going on, increased efforts at regeneration take place in the marrow. In addition to the blood, forming in the ends of the long bones and in the flat bones, the yellow marrow of the long bones takes on a red colour and becomes the seat of active blood formation. As a result a certain number of nucleated red cells find their way to the blood stream; Ehrlich has also emphasized the importance of megaloblasts as a valuable diagnostic sign. Cabot states that they were found by him in 94 per cent of a large series of cases and absent in only 6 per cent.

* In a ward of the Montreal General Hospital 60 per cent of the patients showed evidence of infected gums, teeth or tonsils.

Such a finding doubtless represents a prolonged and repeated search, as these cells are by no means always easily found. In the series of 111 cases at Johns Hopkins Hospital, Wilson and Evans state that nucleated red cells were found in only 58 per cent of cases. As their number varies greatly from time to time repeated search is often necessary. There are however instances where so-called blood crises occur, in which they are present in great numbers accompanied by an increase in reticulate cells; such a condition indicates a period of great activity in the bone marrow. The nucleated cells may be regarded as immature cells poured into the blood before their development is complete, and this explanation holds also for the polychromatophilic cells, the reticulate cells and macrocytes, so constantly found. Irregularity in shape, or poikilocytosis, which is found to a more marked degree than in other forms of anæmia indicates degenerative changes. The white cells often show a decrease of polymorphonuclear cells and a relative increase of lymphocytes. Myelocytes are also frequently met. A characteristic on which much stress is usually laid is a high colour index depending as already stated on an increase in the average size of the cells. An index below 1 is occasionally found, and during remissions in which the cells increase more rapidly than the hæmoglobin a lowered index is usual. The red cells may reach an extremely low point, counts of a million being not infrequent in this disease, although only exceptionally met with in other forms of grave anæmia. Quinke's record of 143,000 shows to what an extreme degree destruction can be carried. The symptoms however do not always correspond to the grade of anæmia and improvement in symptoms is often noted without a corresponding rise in the count and hæmoglobin index. The pallor again is sometimes less than might be expected from the high grades of anæmia a feature attributed by Dukes and Stoper to atrophy of the tissues, to the uniformly higher counts in the capillaries, which they state are as much as 17 per cent higher than in the veins, and to the greater average size of the cells in the capillaries as if the smaller passed more readily to the veins.

In the spinal cord there is frequently a sclerotic change in the posterior and lateral columns. Clinically the cases fall into two groups, those in which weakness, spasm and in-

creased reflexes are present representing lesions of the lateral columns, and those in which ataxia is present representing changes in the posterior columns, whilst the syndrome of ataxic paraplegia indicates a combined sclerosis. Simple numbness and tingling occur without obvious changes in the cord, and are so frequently seen in other maladies that taken alone they have no special significance. Symptoms of myelitis, paraplegia, sensory disturbance, decubitus and bladder paralysis are unusual, but in a case recently seen in the Montreal General Hospital this condition was well marked.

Russell, Batten and Collier drew attention to the association of combined sclerosis and anæmia, and Hurst and Bell (*Brain*, xlv, ii. 266) have reported a series of cases of combined sclerosis with achlorhydria. In some of these cases the symptoms were limited to the nervous system, and in others anæmia of the pernicious type developed.

One of the most remarkable features of the disease is the tendency to remissions. It is seldom steadily progressive but is interrupted by periods of improvement marked by a gain in strength and diminution or loss of dyspnœa. These periods last from a few weeks to several months or even to a year or more. In a remarkable case recorded by Dr. McPhedran twenty years elapsed between the onset and fatal termination of the disease and similar cases have been reported recently by Stockton and by Swan. In McPhedran's case the blood assumed its normal characters at the end of five months and the patient remained well for seventeen years when the symptoms recurred, proving fatal after two other remissions.

In the diagnosis of the disease the whole clinical picture must be taken into account. Setting in gradually so that the patient can seldom fix the date of onset, a high or moderate grade of anæmia with a lemon tinge of skin, especially of the face and hands, and a good state of nutrition suggest strongly the character of the malady. The characteristic appearances of the blood and the high colour index confirm the first impression, particularly when no other cause for anæmia is discovered. The association of symptoms of combined sclerosis and of achlorhydria are also of importance in diagnosis, especially when evidence of hæmolytic is discovered in the blood or urine.

In this country we seldom see severe anæmias due to intestinal parasites. In lands bordering on the Baltic and in Switzerland infection with *Bothriocephalus Latus* or the fish tapeworm is a common condition and about 10 per cent of the affected individuals are said to develop anæmia, the severe forms being indistinguishable from pernicious anæmia by the blood picture and are only recognized by the ova in the stools. Cases of ankylostomiasis may present a severe anæmia and are occasionally found here in Italian labourers. The blood picture however differs and the eosinophilia is suggestive. A case of this nature was recognized by Dr. Powell when a house surgeon at the Montreal General Hospital, and so far as I know was the first seen in this district, if not in Canada. In a case at Bramshott Military Hospital, a severe anæmia was regarded as probably pernicious, and it was thought that the absence of eosinophilia excluded intestinal parasites. Dr. French however, as consultant, noted the absence of fever, so commonly present with an active anæmia of pernicious type, and suggested an examination of the stools; the ova of the parasite were discovered and appropriate treatment was rapidly followed by improvement and cure.

The anæmia of cancer usually presents the characters of a secondary anæmia but in rare cases extensive metastases in bone may be accompanied by a blood picture resembling more or less that of pernicious anæmia. In a still rarer form the marrow may be almost completely destroyed by metastatic growths, and the blood picture and symptoms may then resemble the aplastic form. In all cases of anæmia in patients over fifty years a pelvic examination in women and a rectal examination in men should never be omitted to exclude any latent carcinomatous growth. During or following pregnancy anæmia occasionally develops. In some instances it is of a benign character; in others it closely resembles pernicious anæmia. A fatal result is however not inevitable and should recovery take place recurrence is unusual and the patient may be permanently restored to health.

Whilst the diagnosis of a well marked case is usually easily made, the question arises as to the possibility of recognizing pernicious anæmia before the development of anæmia. Weinberg (*Munch. Med. Woch.*, 1925, Jan. 30), suggests a careful examination of the blood in all cases

of achlorhydria. In a series of such cases he has found other symptoms such as the painful tongue or numbness and tingling in the extremities with a blood picture suggestive of the disease before actual anæmia develops. The colour index may be above the normal; in one case mentioned it was as high as 120, and in another 104. Characteristic changes in the corpuscles were noted, consisting in the presence of poikilocytosis, anisocytosis, megalocytes and normoblasts with a predominance of lymphocytes and a diminution of platelets as much as eleven years before the distinctive signs of a grave anæmia made their appearance. In none of these early cases was there any evidence of hæmolysis, and the blood changes were regarded as due to a stimulation of the bone marrow.

Under the name of *aplastic anæmia* a rapidly fatal form of disease is recognized and usually classed as a variety of the pernicious type. It differs however in two important features. In the first place the bone marrow is yellow and fatty and shows no evidence of regeneration; secondly, there is as a rule no evidence of hæmolysis as shown in the lemon tinge of skin, in the presence of iron in the liver and in increased urobilin in the urine. If these statements are accepted, the disease must be regarded as one due to a defective formation rather than to a destruction of the blood cells. There are it is true a few cases reported in which signs of hæmolysis having taken place have been reported, but Musser explains them as being due to hæmorrhages found in the eye and skin, and notably larger ones from mucous and serous surfaces. Thus in a case recorded by Laverson there were 800 or 900 c.c. of blood in the great serous sacs, a quantity probably sufficient to originate a deposit of iron in the liver and the yellow tinge of skin noted in his case.

In this type of disease there is a rapidly progressive anæmia, uninterrupted by the remissions so constantly found in pernicious anæmia; death usually occurs within three months. It is met with more frequently in females than in males and the age incidence is earlier, the majority of cases are under thirty-two years. The hæmoglobin index is usually below 1 owing to a lack of the larger forms of red cells. The lack of marrow activity is evidenced by the infrequency of nucleated red cells, by marked diminution of the polymorphonuclear leucocytes and by the

absence of myelocytes. There is again an absence of poikilocytosis and anisocytosis; the cells are normal in size or perhaps a trifle smaller than in health and there are no microcytes. The absence of polychromatophilia and of reticulation is of interest, indicating that such cells are the immature products of regenerating bone marrow. The white cells are greatly reduced in number owing to the scarcity of polynuclears, whilst the lymphocytes are relatively increased.

There is a close association between splenic enlargement and certain forms of anæmia. The connection between the two is still obscure. That blood destruction in the spleen goes on in health is a well recognized fact as well as that phagocytosis of the red cells on an increased scale is seen in some forms of splenic enlargement. It has also been shown that the corpuscles are more vulnerable to hypotonic salt solution after passing through this organ, but it is doubtful if these processes are active and important enough to form an altogether satisfactory explanation of a high grade of anæmia, but the marked improvement which takes place in the blood after removal of the spleen is so definite that we must attribute a deleterious influence to this organ in some forms of blood disorders.

We recognize, therefore, a group of cases to which the term splenic anæmias has been applied in which enlargement of the spleen is a prominent feature, and in which none of the known causes of splenomegaly is operative. The organ may be just palpable or form an enormous mass reaching to the pelvis. It is a disease of infancy and childhood and of the first half of adult life; it is extremely chronic, and is often associated with gastric hæmorrhages, so profuse that the first may prove fatal, or recurrences may take place over a period of years due probably to the rupture of varices. The blood presents no characteristic picture and anæmia is in many cases absent for a long period. When present it has the characters of chlorosis but is often aggravated by hæmorrhages. The absence of young blood cells and the diminution of polynuclear leucocytes indicate a lack of response in the bone marrow, and this is doubtless an important element in the development of the anæmia. The white cell count is low, seldom above 8,000 and often as low as 2,000 or 3,000 to the cubic millimeter. That hæmolysis also plays a part is shown by the increased urobilino-

gen, by the deposit of iron in the spleen and by the occasional sallow or even yellow tinge of skin.

In the latter stages of the disease cirrhosis of the liver becomes apparent with jaundice and ascites. The disease assumes the full picture of Banti's disease. As portal obstruction becomes more marked, the tendency to hæmorrhages increases. That all cases of the malady develop cirrhosis is improbable, but whether there is any etiological difference between the cases with and the cases without cirrhosis is unknown.

Thrombosis of the splenic or portal vein has been found in a few cases, and has been regarded as the cause of the disease. This feature, however, is too inconstant to account for any considerable number of cases and is probably a secondary development. W. J. Mayo records nine cases of enlarged spleen and anæmia from syphilis but he regards these as in a separate class although they improved rapidly after splenectomy when specific treatment had previously failed.

Hæmolytic jaundice is marked by a non-obstructive jaundice, an anæmia of varying degree resulting from blood destruction by splenomegaly and by a decreased resistance of the corpuscles to hypotonic salt solutions. One type of this malady is met with as a family disease in which the patient's health remains good and he is capable of carrying on his ordinary avocations. An-

other type of the disease appears to be acquired and is marked by an anaemia sometimes as severe as that of pernicious forms.

Jaundice of a light tinge is subject to exacerbations or crises with fever and leucocytosis. A deepening of the jaundice and an advancing anæmia indicates an increasing blood destruction. During these periods the urobilinuria increases, but there is no bile in the urine and the stools are coloured.

One of the most important diagnostic signs is an increased fragility of the red cells but the large number of reticulated cells indicate that the blood forming function is active. During these attacks the spleen may increase in size.

Owing to the greatly increased blood destruction pigmented gall stones are frequently found, and were present in 60 per cent of the Mayo cases and attacks of biliary colic causing obstructive jaundice are apt to confuse the clinical picture. The brilliant results obtained by splenectomy render it one worthy of careful study, and as complete recovery has been obtained in many cases this measure is one which should always be carefully considered. If operation be decided upon it should be undertaken only during a period of remission; a fatal outcome usually follows any operation attempted during an exacerbation.

Treatment of Thrombo-Angiitis Obliterans.—

Samuel Silbert, New York, has used repeated intravenous injections of hypertonic salt solution in the treatment of sixty-six cases of thrombo-angiitis obliterans. Improvements have resulted in the majority of patients, those noted being cessation of pain, increased temperature of the extremity, growth of the nails, healing of ulcers, and reopening of obliterated vessels. No dangerous reactions or untoward results of any kind have been noted in more than 2,500 injections. Four consecutive successful amputations below the knee have been done in four advanced cases after preliminary saline treatment. If begun before the disease is too far advanced, treatment of thrombo-angiitis obliterans by repeated injections of hypertonic sodium chloride solution will check the progress

of the disease and will restore the patients to health and usefulness in the majority of instances. Only in the case of sodium chloride solution is there any originality in the method of treatment. Sodium chloride was selected for the hypertonic solution because it is the salt to which the body is accustomed, and because 15 gm. can be administered without danger of toxicity. The solution is prepared in freshly distilled water, filtered, and immediately sterilized. At the present time, 5 per cent sodium chloride is used, 150 c.c. for the first injection and 300 c.c. for all subsequent injections. The injection is given into a superficial vein in the usual manner by the gravity method; the fluid is allowed to run into the vein slowly during ten minutes, and the patient is kept flat on his back during this period.—*Jour. Am. Med. Ass.*, June 5, 1926.

POST-OPERATIVE PULMONARY COMPLICATIONS

A STUDY FROM THE SURGICAL AND GYNÆCOLOGICAL RECORDS OF THE TORONTO
GENERAL HOSPITAL, AND FROM THE DATA AND COLLECTION OF THE
DEPARTMENT OF PATHOLOGY OF THE UNIVERSITY OF TORONTO

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PART I*

A NEW interest was created in the subject of post-operative pulmonary complications by the articles of Pasteur,¹ Rose Bradford,² and later writers³ on the occurrence of massive collapse of the lungs following abdominal operations. Thanks to their insistence we were placed in the position of being able to recognize three cases of this peculiar lung condition within the short space of five weeks, and saw many other cases in a "chest wound" series, which seemed to typify Pasteur's description. These cases have been described and the clinical conditions referred to.⁴ They seem to be a post-operative happening found usually in direct proportion to the searcher's familiarity with the literature on the subject; they have symptoms of onset and certain physical signs which are unlike those of the more commonly noted post-operative lobular pneumonias.

As if to strengthen this newly created interest, and led chiefly by Wharton and Pearson⁵ and Wharton and Hampton,⁶ we have returned in the last few years to the recognition of the part played by emboli in the production of post-operative pulmonary complications; "minor emboli" in particular which tend to appear late in convalescence, imitate very closely an acute pleurisy, and are at times found to be in evident association with a thrombo-phlebitis of the femoral or abdominal veins. In giving careful consideration to the accumulating records concerning the so-called massive collapse of the lungs, one soon feels that some few of the acute pulmonary accidents which take place within a few minutes or hours of operation, are certainly happenings of this

nature. The analysis of any group of post-operative pulmonary complications gives also a very definite and large percentage of cases whose history suggests that minor emboli from thrombosed vessels at the site of the wound, or from thrombi elsewhere formed were causing the acute respiratory-system involvement. Massive collapse of the lung should be thought of when considering any extensive and rapidly formed consolidation occurring after operation; minor embolism is a diagnosis which should be freely made in the presence of a late developing pleurisy with or without an evident phlebitis. No tabulation of post-operative pulmonary complications can be looked upon as accurately analytical, if in its columns there be found no reference to these two conditions.

In most classifications of "the pulmonary accidents of surgery" it is recognized that lobar pneumonia, broncho-pneumonia and bronchitis—conditions which occur as a result of many contributing causes—are the most common pulmonary affections met with following operations under general anæsthesia. "Ether pneumonia", aspiration pneumonia, must be, however, a happening immediately related to the operation, and the diagnosis of post-operative pneumonia as a result of operation should be reserved for those cases which have developed their signs and symptoms within two and three days of the surgical procedure. It is admitted that a lung infection like lobar or lobular pneumonia may assail any patient in his convalescence, but it has never been sufficiently emphasized that a lung condition occurring suddenly, as late or later than four or five days after the operation (and there are many such) may be due to causes other than lung irritation, infection and inflammation.

* Part II of this interesting paper will be published in the August issue.

The diagnosis of "post-operative pneumonia" is still frequently made with a femoral thrombophlebitis in sight, a normal temperature, and the day of operation ten or twelve days gone by. Pulmonary accidents occurring under such circumstances are more certainly embolic in nature.

The well-kept records of the surgical and gynaecological services of the Toronto General Hospital made an investigation of a three-year period of post-operative pulmonary complications an unusually easy matter; pneumonias, lobular pneumonias, bronchitis, pleuritis, empyemata, abscesses, gangrene, infarction, phlebitis, embolus and thrombosis were searched for under their respective headings and their relationship to the preceding operation carefully considered. An attempt was made to exclude from the series all septic cases, and those cases, which from their complications or bad physical condition, might be considered as likely to have developed pulmonary lesions, such as terminal pneumonias, or septic pulmonary emboli, even without the shock of an operation. With such restrictions, a comparison of the stormy post-operative period with a quiet or afebrile pre-operative stage, was frequently possible, and gave interesting suggestions, which would otherwise have been lost in the fever of infection or accompanying disorder. It was also endeavoured by an analysis of the history to estimate the life expectancy subsequent to the particular operation.

A further restriction was made in dealing with the question of pulmonary abscess as a post-operative pulmonary complication, if the abscess were attributable to inhalation of blood, secretions, or foreign body, or if following close upon operations on nose, mouth or upper air passages, it seemed reasonable to consider it as an aspiration result, rather than as something ensuing upon the mere surgical procedure. Emboli through the veins from the wound site in a tonsillectomy, or extension along the lymphatics to the lungs from the sloughing area left when dirty tonsils have been removed, have been popular explanations of the occurrence of lung abscess after these operations on the throat,⁷ but such explanations would not apply to an abscess following a clean sub-mucous resection, or to the abscesses following upon

teeth extractions and upon this latter operation ensued the majority of the pulmonary abscesses noted as being post-operative pulmonary accidents. The suspicion must still remain that aspiration of blood, secretions, or foreign body, into the lung is the more probable cause of pulmonary abscess subsequent to operations in the nasal, oral and pharyngeal cavities, though it will always be recognized that operations elsewhere in the body are at times associated with abscess and gangrene, which may have developed either from a post-operative lobular pneumonia or from an embolic infarction which has broken down as a result of an added infection.

Looking at post-operative pulmonary complications of clean surgical cases *en masse*, and in the light of some of the details just mentioned, one notes that they have a history and course which varies materially from that of the better known infectious lung disorders. The rapidity with which the temperature and pulse rate may rise after operation, when lung irritation is developing, is striking to a degree; within a few hours the picture of an acute diffuse lobular inflammation may be in evidence. The absence of both chill and pleural pain in the post-operative "pneumonias" suggests at once that a process different from that of the pneumococcus infections is developing; *herpes labialis* is rarely noted; neither serous or purulent effusions tend to accompany or to follow these post-operative pneumonias directly, though when an abscess has formed in one of them, it may have pus in the pleura as a complication or sequence. As regards the types of post-operative pulmonary accident with signs of acute pleural involvement in a clean case, it is to be insisted upon that they also are rarely associated with effusions; a feature which suggests that the irritating agent is non-infective in origin. It should be noted also as a point of clinical import that the infarctions associated with these pleuritis may be of an area large enough to provoke the diagnosis of a pneumonia.

The term so often used in this paper "subsequent to operation" as concerns the pulmonary accidents of surgery may almost be held to mean "subsequent to abdominal operations", for it is pre-eminently the operation on the abdominal viscera or pelvic organs that is followed by pneumonias, "minor-emboli"

pleurisies, or gross fatal embolic happenings. Operations upon the head, thorax or extremities are not, however, exempted from the liability to post-operative pulmonary lesions, as the following figures will show: "pulmonary complications subsequent to abdominal and pelvic operations, 102; subsequent to operations elsewhere in the body, 8." The determination of the nature of the pulmonary accident following upon an operation elsewhere than in the abdomen, is a matter of the greatest importance; one feels that the history of the cases analysed, indicates that fat embolism or thrombo-embolism has been the condition present rather than an outspoken lobular pneumonia.

The point of greatest interest in the study of the post-operative lung conditions is the distinguishing of the type of the pulmonary complication which has followed the operation; three distinct clinical groupings are clearly in evidence.

1. A large group of cases in which the respiratory signs occur quickly, or begin to develop within a few hours of the operation, and whose progress suggests a bronchitis or a lobular pneumonia. The majority of all post-operative pulmonary complications belong to this group, and in this group alone is seen a seasonal incidence. Possibly in these cases, since the great majority received ether, inhalation irritation and infection stand far forward in the ranks of causation. Rapid onset after operation, and absence of pleural pain are striking features which further suggest inhalation into the lung substance as a determining factor in the production of the lung injury. In this group must often be found the examples of massive collapse, and it should be remembered also, that the rare cases of fat embolism seen particularly after bone operations, and after operations upon the abdominal wall or breasts, may show their symptoms within the first few hours. The mortality in this type of post-operative pulmonary complication ranges from 20 to 60 per cent.

2. A group in which the record room filing is that of pleurisy. Investigation of these histories shows an almost regularly recurring picture. A clean operation is followed by a fever of 100°-103° for a few days with nothing to explain the cause thereof; this febrile period

of from three to eight days gives place to several days of normal temperature, one to twelve days, rarely more. Following the afebrile period there is the sudden appearance of an acute pleural attack, pain, rub and fever. The pleural attack may be repeated on the same side, or may appear upon the other. A femoral thrombo-phlebitis is a not infrequent complication appearing shortly after or with the pleural attacks, and should assist in the recognition of this type of pulmonary complication.⁵ It may be suggested also, that in many instances a thrombosis of abdominal veins is responsible for such a typical picture, a thrombosis not yet in evidence by any physical signs. The more outspoken phlebitis may perhaps be taken as indicating that the major portion of the thrombus has become adherent to the vein wall and will not migrate; fragments only are detached and the embolus is not large enough to endanger life. Pleuritis with pain, or a pleural rub, is allowed time to develop. Several of the cases diagnosed as post-operative broncho-pneumonia, and giving a history of acute pleural pain are distinctly better placed in this group; the late onset of the pleural and pulmonary signs, their appearance in an afebrile period of convalescence certainly delimit them from the cases of broncho-pneumonia developing immediately after the operation. The majority of the cases of this type of pulmonary complication recover.

3. The group of cases more clearly defined as gross emboli from thrombotic processes. These cases are more usually seen following operations in the lower abdominal area, and especially after operations for the removal of uterine and pelvic tumours.* They are practically always associated with thrombosis of the pelvic or femoral veins, and occur most frequently as late complications in the first and second week of convalescence. Like the cases of the foregoing group, they are preceded in their development by a fever wave of undetermined origin (the fever of thrombosis); they terminate fatally as a rule, and can be looked upon as cases of thrombosis in which the thrombus migrates in bulk to the lung, and by its size either kills at once or puts the patient's life in jeopardy for some hours.

* Seven of the twelve instances of gross emboli were recorded from the gynaecological service of Professor W. B. Hendry.

Some latitude in point of time of appearance must, of course, be given to thrombus formation and detachment. Possibly, there is a time of both early embolism from the wound site, and of later more serious embolism from thrombosis in the large veins. It would seem likely that a multitude of small emboli are early set travelling from the field of action at the time of the operation wound. Some have claimed⁹ that infarction resulting therefrom can be demonstrated in the lungs by x-ray investigation as a common event, and this even in the absence of symptoms. It would be difficult in the first few hours after operation to distinguish such embolic infarctions from pulmonary inflammation if they were seen about the lung hilus, particularly if a general anaesthetic had been given. In some instances, the suggestion of minor emboli with acute pleural symptoms may be given in the first twelve or seventy-two hours after operation; this is however unusual; a period of late thrombus formation, often in veins remote from the field of operation, seems a necessary part of the process. Massive emboli giving symptoms, and causing death within a few hours of the operation, are also to be reckoned with. Nevertheless, the majority of the large emboli are set wandering late in post-operative convalescence. Thrombus formation in the pelvic veins, particularly in the presence of large uterine tumours, is a well recognized condition quite apart from operation, and may give rise to fatal or serious embolic accidents unduly early in the operative or post-operative period. One of the cases analyzed in this collection died as a result of pulmonary embolism, less than twenty-four hours before the time set for an ovariectomy.* The association in many of these "embolic cases" of a femoral or pelvic thrombo-phlebitis may give a definite clue as to the nature of the pulmonary accident. It is further to be noted that a femoral thrombo-phlebitis occurs as a complication of clean abdominal wounds in a small but regular percentage of cases, and that of one hundred and twenty admissions indexed as phlebitis in three years' surgical records, not less than fifteen are post-operative, in clean cases, and of unexplained origin.†

The clinical grouping just outlined, a group-

ing founded on the facts as put before one, contains an evident suggestion, namely, that these forms of pulmonary lesions are the basic or primary post-operative lung accidents. Effusions, abscesses, gangrene, develop upon the lobular pneumonias and the minor, or the gross emboli. Future classification must give a place to both fat embolism and to massive collapse as basic lesions. There are no records as yet indicating that abscess, gangrene or purulent effusions follow upon these two conditions. Small serous effusions have co-existed with collapse of the lung in some cases; they may help to relieve the extreme negative pressure which must develop as the lung retracts. In cases with weakened heart action there might be considered the possible occurrence, as a primary lesion, of infarction of the lung without embolus.

The relation of post-operative, pulmonary accident to thrombo-phlebitis, its identity at times with massive collapse, fat embolism or even infarction, must be carefully borne in mind, when comparing the after effects of various forms of anaesthesia. A major operation done under a local anaesthetic will run the same chance of being followed by embolism as will the same operation done under general anaesthesia.* Massive collapse has been described as occurring after local anaesthesia, possibly in association with emboli.¹⁰ The bronchitis, and the lobular pneumonia, which ensue after crushing accidents, after operations on bone, and after operations in the fatty tissues of the breast and abdomen, are in many instances due to fat embolism, the symptoms of which are indistinguishable from a very acute progressive lung inflammation due to infection and aspiration.¹¹ A study of the cases of post-operative pulmonary complications which have followed the use of a local anaesthetic will reveal the fact that singularly few of them have shown the signs and symptoms of an active lobular pneumonia beginning in the first few hours after operation. It will usually be demonstrable, on the other hand, that these cases occur late and have symptoms suggestively embolic. An acute bronchitis, a lobular pneumonia, following quickly after local anaesthesia, should always suggest the diagnosis of fat

* Gynaecological records, No. 53,572.

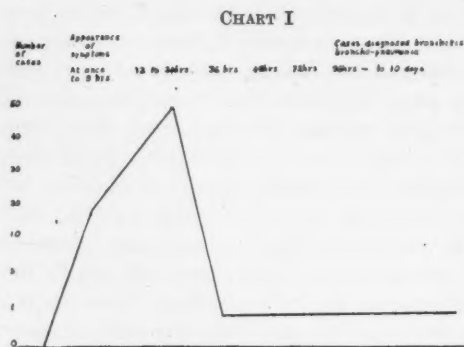
† Surgical records, service of Professor C. L. Starr.

* Unless of course the "acidosis" of general anaesthesia has some "thrombogenic" influence.

embolism, and one must in fairness add that many deaths after the use of a general anæsthetic have not been due to aspiration pneumonia, but to an intense irritation from the fat deposited in the lungs subsequent to its being set free by crushing of marrow, or laceration of other fatty tissues. The general anæsthetic and the aspirated secretion must always be suspected however, of being active contributory agents in the production of acute post-operative lobular pneumonia, and if it be shown that thrombo-embolism, fat embolism, and massive collapse are the only lung accidents which follow local anæsthesia, then these two agents are more than ever to be blamed in seeking to determine the cause of the inflammatory lesions of the lung met with after operation.

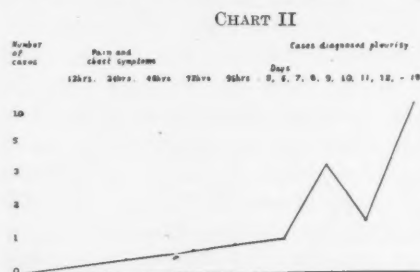
It is difficult to believe that post-operative pulmonary accidents follow indiscriminately any form of anæsthesia. It is difficult to imagine the administration of a local anæsthetic being attended with an inflammatory or bacterial lung complication. Five instances of "lobular pneumonia" in our series are recorded as being subsequent to major operations under novocaine, anocaine or cocaine alone; two of these cases are clearly embolic accidents late in convalescence; one is a lobular pneumonia complicated with a peritonitis six weeks after the operation; one is a late occurring unilateral consolidation, seventy two hours after operation. In only one case, a bronchitis, do the symptoms of lung irritation and signs of infection (fever) develop in the early post-operative period.

It is a recognition of this defined relation of anæsthetic to the lung lesion, and the realization of the clinical grouping of the cases before given, that invites the suggestion that the majority of pulmonary affections of the early hours or days after operation are inflammatory, and dependent largely upon irritation and infection, probably from the anæsthetic and aspiration; while those occurring later than the third or fourth day after operation are suggestively due to other causes and may be ascribed to emboli and infarction from a recognized or unrecognized thrombosis. Chart I shows how clearly related to the operation in point of time are the cases listed as pneumonias. Of six cases evidently not belonging here but diagnosed as pneumonia and occur-



The period in hours after operation in which "irritation lesions" appear.

ring later than forty-eight hours after operation, one was a developed pneumonia with severe abdominal pain subjected to laparotomy but with negative findings; one developed temperature and signs of lung involvement three days after operation, a note says "trachea was drawn to the left" and massive collapse is suggested by the history; two with fever following the operation, but with no lung signs, die with the classical symptoms of embolism on the tenth and twelfth day of convalescence; two run the course ascribed to "minor embolism"; a post-operative fever of undetermined origin; a fever free period; then the outbreak of acute pleural symptoms. A chart constructed in the same manner as the preceding, shows how late in the convalescence acute pleuritis and gross emboli tend to be seen (Chart II). Several of the cases dia-



The period after operation, in hours and days, in which acute pleuritis tends to appear.

nosed as bronchitis, broncho-pneumonia or pneumonia, indicated by their symptoms and time appearance that they were better placed in this group of late appearing lesions. In most of the instances of fatal emboli and acute pleural involvement in the post-operative period, a slight fever wave lasting three to sixteen days, is seen to develop upon the operation, and to be followed

by an afebrile period of from three to fourteen days: after such an interval as a rule ensued the sudden death, the intense dyspnoea, or the outbreak of pleural pain and pulmonary lesion.

The course followed by the temperature record of these post-operative pulmonary embolism cases, the minor and the gross, is noteworthy and may be looked upon as typical of the condition; too little attention has been paid to the symptoms and signs of thrombosis which may follow a clean surgical procedure; sudden death is the usual terse and tragic history without any recognition of the fact that a warning has been early sounded in the unexplained post-operative fever, "the fever of thrombosis", to use the words of some observers. It has long been insisted upon by the gynaecological surgeons that pulmonary embolism from thrombosis of the pelvic or femoral veins is the most common cause of death subsequent to hysterectomies, ovariectomies or operations in the pelvis. The slight fever existing before operation in two cases of hysterectomy for large fibroids might be taken as indicating that thrombosis of the pelvic veins was already in existence (cases 45,469 and 54,463); the interesting history of case 53,572, dying a few hours before the time set for operation and showing at autopsy extensive thrombosis of the veins of the pelvis and massive pulmonary embolism is probably duplicated in the records of any large hospital.

Presented in the form above suggested, the early irritative and the late embolic lesions, post-operative pulmonary complications may perhaps offer themselves for a readier recognition than heretofore. The early irritative forms would include the rare examples of massive collapse of the lungs, the lobular pneumonias due to aspiration-irritation and fat embolism. The later embolic lesions would embrace the pleurisies and infarctions due to minor embolic accidents and the more readily appreciated sudden deaths or

urgencies attributed to the gross emboli. Thrombo-phlebitis acquires a new importance if found existing co-incident with these pulmonary accidents; its bearing upon post-operative fevers of undetermined origin has been indicated and its relationship to late occurring "infarction-consolidation" should be always borne in mind when making a diagnosis of a pleurisy or pneumonia¹² late in the operative convalescence.

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Experience with Cholecystography in Cases Coming to Operation.—C. C. McCoy and R. S. Graham, Cleveland, have used sodium tetraiodophenolphthalein in twenty-six cases. The cholecystographic diagnosis failed of confirmation in only one case, and in it the findings were somewhat equivocal. In 212 cases col-

lected from the literature, with intravenous administration of the dye, the cholecystographic diagnoses were confirmed in 91 per cent. In cases with oral administration of the dye, the confirmation was more than 80 per cent.—*Jour. Am. Med. Ass.*, June 19, 1926.

THE ORAL ADMINISTRATION OF GLUCOSE

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GLUCOSE (dextrose or grape sugar) is found very widely distributed in the vegetable and animal kingdoms, and occurs both in the free state and in combination with other sugars. It is the end-product of the digestion of starch, glycogen and maltose, and one of the products of the hydrolysis of sucrose and lactose. In whatever form carbohydrates are taken into the body they are all changed into glucose before they can be utilized by the tissues. If any other sugars than glucose get into the circulation, as sometimes happens when they are taken in excess, they are treated as foreign bodies and are thrown out by the kidneys unchanged.

Seeing that glucose is the only carbohydrate that can be used by the tissues and that it requires no digestion but is directly absorbed, it would seem to be the best form in which to administer the necessary carbohydrates when from any cause the digestive functions are more or less in abeyance. My attention was attracted to the use of large amounts of it by the mouth by two papers that appeared in *The Lancet* written by Izod Bennett of the Middlesex Hospital.^{1,2} Since reading these I have used glucose given orally constantly during the last two years and have nothing but praise for the procedure. Patients like this sugar well, assimilate it well, and nearly all greatly benefit by the additional nutriment thus provided.

For many years glucose has been used interstitially and intravenously in urgent cases, but it is with the oral administration only that we are now concerned.

The question naturally arises, what is glucose? The chemical answer to this question is very different from the commercial one. Chemically, glucose, $C_6H_{12}O_6$, is the aldehyde derivative of a polyatomic alcohol. It is a monosaccharide, as distinguished from the disaccharides and polysaccharides. It has a caloric value of 4.1. Commercially considered, "glucose" may be a mixture of dextrose, maltose, often cane sugar, dextrine and water. Such is the B.P.

glucose and what is known as "commercial glucose." These glucoses are made by the action of an acid upon starch. Formerly sulphuric acid was used for this purpose but several epidemics of arsenical poisoning occurred from its occasional contamination with arsenic so now hydrochloric acid is employed. "Commercial glucose" occurs on the market as corn syrup, potato syrup, "glucose, B.P." and also under various trade names. Some two years ago the Editors of the *Therapeutic Gazette* asked the question as to the meaning of "glucose" of Dr. W. R. Catheart, Technical Director of the Corn Products Refining Company of New York, and he pointed out³ that ordinary commercial glucose contains about 31 to 35 per cent of pure dextrose, with dextrine (non-reducing carbo-hydrates, not starch) about 40 per cent, often some cane sugar, and the balance of water. The ordinary glucose supplied by the St. Lawrence Starch Company to the Toronto General Hospital contains dextrose 37 per cent, maltose 13 per cent, dextrine 28 per cent, and water 20 per cent. With the various pure forms of dextrose supplied for intravenous and interstitial use we are not now concerned.

The form of glucose that Bennett used was the commercial or B.P. one. It is much cheaper than the pure forms and can be got at any grocers, and does quite well for oral administration. It is the one that I have used entirely in this work. The amount usually given in the twenty-four hours is one pound, which roughly represents about 1000 large calories. This quantity is stirred into a quart of boiling water; the juice of two lemons is added, and the lemons are then chopped up and thrown into the mixture which is boiled for five minutes, and finally the solution is strained. The result is a very pleasant lemonade. With children it is better to add less lemon juice, and they take a more dilute solution better. In

our Hospital for Sick Children a 5 per cent solution of dextrose is used.

It is commonly believed that if a healthy adult is given at one time more than 200 grammes of pure glucose by the mouth, some of it will appear in the urine, but this is certainly not common. Taylor and Hulton⁴ found that 400 grammes often produced no glycosuria and never much. A slight rise in the blood sugar soon occurs but the tissues quickly deal with this, partly by assimilation and partly by dilution with water drawn from the subcutaneous tissues. Three hours after the taking of such large amounts the blood sugar is usually normal.

Woodyatt, Sansum and Wilder⁵ have determined that a man weighing 70 kilos when resting quietly may receive and utilize 63 grammes of glucose by vein per hour, which equals 252 calories per hour or 6048 per day. But at present we are dealing with the oral administration and it is superfluous to point out that substances swallowed are not yet really in the body, and the question arises as to how quickly and completely is swallowed glucose absorbed. Carl Cori,⁶ working with rats, found that no matter how much glucose was placed in the stomach, or what the concentration of the solution, a definite amount was absorbed per hour. This was about 1.72 grammes per kilo of body weight, and this absorption was not affected by any degree of starvation and never produced glycosuria in the animals. Sansum and Woodyatt⁷ found the figure to be about the same for dogs, and presumably it would be more or less the same in man.

It will be at once seen that there is a discrepancy,—a dog will absorb 1.72 gms. per hour of glucose without any glycosuria occurring and yet his limit of tolerance per vein per hour is .85 gm. I do not think that this discrepancy has yet been explained.

When glucose is absorbed it is immediately used up or else is changed into and stored as glycogen, ready to be changed back again as the need for it arises. The ultimate end-products of its metabolism are water and CO_2 , so no strain is put upon the organs of excretion as may be the case with the end-products of the metabolism of proteins. It is easy to see how valuable this may be in cases of renal insufficiency. The late Professor John Wyllie of

Edinburgh used to give a temporary diet of pure arrowroot and water in cases of acute nephritis, but glucose should be even better as it requires no digestion.

It seems that even in cases of diarrhoea no glucose is lost in the stools and hence it is all absorbed, unless, indeed, one counts the small amount that may be broken up by the bacteria in the bowel. Its presence there should theoretically encourage the growth of the acidophilus group. These form gas with many sugars, and one would expect that this excess of CO_2 might produce some intestinal distension, but practically I have never had any complaints of this, even in bad cases of pneumonia where tympanites is so apt to occur. Moreover, Cori in his experiments found that the losses of sugar due to bacterial action were so small that they may be neglected in any calculations.

It has been very definitely shown by numerous workers that while most of the absorbed glucose is burnt up, and thus produces heat and energy, some of it may be transformed into fat, which partially accounts for the gain of weight that usually accompanies its use, although this is also partly explained by its being a fat- and also a protein-saver.

Considering what an amount of pure glucose may be taken without any glycosuria appearing, we need not expect this to occur when the commercial product is used, unless, indeed, the pancreas is not functioning sufficiently, in which case glucose should not be used or should be given in conjunction with insulin, but I have no experience of any cases where this was required.

I will not burden this clinical note with a list of cases in which glucose has been used with beneficial effects, although this would be an easy task. In severe pneumonia the digestion may be at a standstill, and any food that requires digestion will remain unchanged, and may give rise to distress, but glucose is easily absorbed and may keep the patient going until the crisis or lysis is reached. The same remark applies in severe influenza and bronchitis. Several very toxic cases of Graves' disease that were vomiting everything, were able to retain and utilize glucose. In regard to diseases of the stomach and intestine Bennett writes as follows, and with his conclusions I entirely

agree: "A numerous group of diseases of the alimentary tract is that in which undernutrition is the most outstanding feature. I refer to that class of patient, whom one encounters so frequently, in whom, whether there be an organic lesion present or not, abdominal pain and discomfort have led to curtailment of the diet, loss of weight has aggravated the symptoms, and starvation and undernutrition have become the most prominent physical features. In such patients it is often essential to secure a diet which will not only sustain life, but will also help to restore their lost subcutaneous and intra-abdominal fat, and usually a high carbohydrate diet is the method of choice for securing this." In starvation there is always a tendency towards acidosis. After the reserve of glucose and glycogen have been used up the tissues call upon the fats for the production of energy, and as these are incompletely burnt in the absence of glucose, ketone acids are formed and thus an acidosis occurs. The administration of glucose tends to prevent this, and, especially in children, is of great value as pointed out by F. B. Talbot.⁸ In old arteriosclerotic people who are emaciated, it is often possible by its use to produce much gain in weight and energy, and this without adding in any way to their probably existing toxæmia. I recall an old man of this type, who for long

remained much under weight, and who put on seven pounds a week for several weeks when we added the glucose to what he was already taking.

Of course it is fully recognized that glucose is invaluable in acute hepatic disease, such as acute yellow atrophy of the liver, delayed chloroform poisoning, and poisoning with salvarsan, phosphorus and other drugs.

To summarize, in cases of malnutrition, acute or chronic, glucose in large amounts by the mouth is a valuable method of increasing the available energy and of aiding in the gain of weight, without putting any strain on the digestion or on the organs of excretion. It is scarcely necessary to add that it should not be used if there is any sugar in the urine, and it is well to watch the urine occasionally in patients who are taking it although its use will very seldom be found to give rise to any glycosuria.

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The Health Needs of New York.—The Public Health Committee of the New York Academy of Medicine has recently summarized the problems facing the city with regard to its health needs as follows: decentralization of population and better housing conditions; strengthening of the sanitary safeguards in food and milk production and distribution; adequate sewage and garbage disposal; systematic development of health education based on sound principles; supervision and control of occupational hazards; extension of outdoor recreational facilities, and suppression of obnoxious and deleterious odors, dust and the smoke nuisance. Disease control is a well recognized aspect of public health control, and the New York committee has given prominence to the baffling nature of some

of the communicable diseases of the central nervous system and has suggested the organization of a commission for the study of the etiology, pathology and epidemiology of these. It has also called attention specifically to the inadequate control of whooping cough, which stands as the third highest cause of death among the acute infectious diseases. In many respects the physician is necessarily an individualist. Yet there are times when the attainment of the great ends to which he has dedicated his life—the safeguarding and protection of the public health—can best be served by combined action rather than by working alone. The altruistic efforts of the Public Health Committee of the New York Academy of Medicine indicate how well our profession can serve in this respect.—*Jour. Am. Med. Ass.*, June 19, 1926.

THE RELATION OF THE LABORATORY TO THE PRACTICE OF MEDICINE*

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THE subject which we have chosen for discussion at this, the opening meeting of the Section of Pathology, while somewhat aside, perhaps, from the beaten path, is one, however, which we believe is well worthy of consideration. While it is true that the laboratory has an important place to fill in the practice of medicine in that it frequently furnishes a valuable guide to the clinician in the matter of diagnosis and treatment, it is also true that its importance has, at times, not only been decidedly underestimated, but at other times has been without doubt overestimated, and while it must be borne in mind that modern clinical medicine and clinical surgery have made, and will continue to make, some of their chief advances only by the help of the laboratory, it must also be borne in mind that these same laboratory procedures, no matter how valuable they may be, can never take the place of clinical study and clinical judgment. At best they can only furnish some additional evidence which must be weighed and considered in connection with all the other facts obtainable. The temptation which may come to some clinicians who have grown up, as it were, with the newer methods of laboratory diagnosis, is to rely solely upon the verdict of the laboratory, and thus save themselves the trouble of making a thorough physical examination of the patient. This is a temptation to which many of us are sorry to say have too frequently yielded.

The ideal arrangement in laboratory service would be one in which the physician himself is a trained clinical pathologist, and has the time either to perform or oversee the various laboratory examinations. Having first-hand knowledge of the clinical symptoms, the tests and their interpretations are made accordingly, and are applied either to confirm or disprove certain suggestions obtained in the history or by physi-

cal examination. The extent of their other duties, however, the limitations of time, and the many technical details and varied equipment necessary in the newer laboratory procedures, prevent the majority of physicians from carrying out anything more than some of the simpler and more frequently called for laboratory tests. Under such circumstances, then, the next best arrangement appears to be that in which the work can be carried on in more or less centralized laboratories under the supervision of those trained in this particular branch of medical science.

It is not the purpose of this paper to outline the various procedures which are in use in such centralized laboratories, and dwell on their respective merits, but rather, in a more or less general way to draw attention to certain features, a recognition of which, we believe, might lead to a better understanding between pathologist and clinician. Throughout this paper, for the sake of brevity, we shall use these terms in their widest sense and in the short time at our disposal this evening we will consider, on the one hand, some of the limitations of the laboratory, and on the other hand the value of closer co-operation between pathologist and clinician, with some suggestions as to how this co-operation may be brought about.

At the outset, then, we would state that the laboratory has its limitations and that it is by no means the be-all and end-all of medical practice. We cannot emphasize too strongly that, with few exceptions, the verdict of the laboratory should not be considered as the court of final appeal, but its statements should be taken into consideration with other available data, including the history, symptoms and physical findings. There are, it is true, certain laboratory tests which are final, and which must be accepted as such. As an example we might mention the selection of a donor for transfusion. Here the clinician must depend solely upon the result of

* Chairman's address read before the Section of Pathology, at the Academy of Medicine, Toronto, October 27, 1925.

the laboratory test. But in the great majority of instances the results obtained in the laboratory should be placed alongside the clinical findings and conclusions drawn from the whole. Allow me to illustrate:

A patient may be suspected of having typhoid fever. The clinician takes blood for a Widal test and in due course receives the report that the Widal test is positive. That does not necessarily mean that the patient is suffering from typhoid fever. He may be, and that is the usual interpretation to be placed upon such a report, but on the other hand he may have had typhoid fever at some previous date, and still have antibodies in his blood stream, or he may have been inoculated against typhoid. These possibilities, therefore, must be taken into consideration in interpreting the result of the test.

Another example is the tuberculin test: while this is not a routine laboratory procedure, yet it frequently happens that the pathologist is called upon to make the test. Here again, a positive result does not mean that the patient is suffering from active tuberculosis. A positive test simply means that somewhere in the body is a tuberculous focus which may be either active, quiescent or healed. A negative test, on the other hand, in the absence of any acute illness, can be relied upon as fairly accurate evidence that the body is free from tuberculosis; but if the patient is quite ill and the test negative the possibility of tuberculosis is by no means eliminated, since 50 per cent of the cases of tuberculous meningitis dying in the Hospital for Sick Children give negative tuberculin tests during their last illness. The reason for this we shall not take time to attempt to explain here.

Again, the interpretation of the results of a bacteriological examination of throat cultures for diphtheria bacilli calls for some consideration. The mere presence of these bacilli in cultures does not mean that the patient is suffering from diphtheria. Individuals who may harbour these bacilli in their nose or throat may become ill with some other disease, and the finding of the bacilli be only incidental. On the other hand, one negative report from a case of clinical diphtheria should by no means be accepted as final, but should call for a second culture, since much may depend upon the location from which the swab has been

taken, and whether or not the membrane was covered at the time by mucus or other material in which the bacilli may be comparatively scarce.

These few examples may serve to illustrate the importance of comparing the clinical and laboratory findings.

Let us now consider the second phase of our subject, viz; that of closer co-operation between clinician and pathologist. Those of you who were present to hear the inaugural address of our President will recall that, among other things, he emphasized the importance of closer co-operation between the general practitioner and the specialist. In like manner we wish to emphasize to-night the value of a similar relationship between clinician and pathologist. As a step toward this end we should like to encourage the clinician to furnish the pathologist with a few facts concerning the case when supplying material for investigation or diagnosis. The principle adopted by certain physicians of purposely withholding from the pathologist all clinical information lest he be influenced in his diagnosis, does not tend to serve the best interests of the patient, clinician or pathologist. Not only is information at times purposely withheld, but I happen to know of cases in which physicians would supply data, absolutely false, in an endeavor to "catch" the pathologist.

We believe, however, from our personal experience, that physicians of this type are decidedly the exception, and while frequently very little data or none at all may accompany the specimen, we believe the reason to be either that the clinician does not appreciate the value of such information, or does not take the time to supply it. To attempt to carry on laboratory work without any contact whatever with the patient, or any information regarding his clinical condition, tends to make of the pathologist a mere technician and the value of his reports will be estimated accordingly. On the other hand, a few words as to the age and the sex of the patient, the source of the material, and the nature and duration of the disease, not only serve to make the pathologist's work more interesting, but, what is more important, frequently enable him to give a more satisfactory report to the clinician.

Allow me to illustrate. Recently a specimen

of tissue was left in the laboratory for examination and diagnosis. The material was labelled curettings and the name was "G". The interne who received the specimen made the entry in the book under "Mrs. G., uterine curettings". When the sections were ready for examination, I was somewhat puzzled by the appearance. The tissue consisted of granulation tissue, but bore no resemblance whatever to uterine or cervical mucosa. After a time I was able to get into communication with the physician, when I learned that the curettings were not of uterine origin at all, as the interne had understood when he took the specimen in, but were from an ulcer on the leg of Mrs. G.'s husband.

Still more recently another specimen was received labelled "cyst from arm". While the specimen was not typical of anything in particular, but showed both chronic inflammatory and degenerative changes in the cyst wall, I made a diagnosis of either chronic inflammation in a degenerating sebaceous cyst, or the remains of a tuberculous gland, and suggested a tuberculin test. Before this was done, however, I learned that the patient, who was two years of age, had been given a dose of whooping cough vaccine about one year ago. A lump developed immediately at the site of inoculation and persisted until the time of its removal. I should like to challenge any pathologist to make a diagnosis from the gross and microscopic examination of the tissue of a "whooping-cough vaccine cyst."

Again the relationship between the clinician and the laboratory might be strengthened, were more attention paid by the clinician at times to the collection and sending in of his material. Let me mention a few items in detail.

1. *Pus*.—This should be fresh and, when possible, there should be plenty of it. Frequently we receive for examination one small swab in a tube and that quite dried up. Examination of such material as this is apt to be disappointing both to the pathologist, and to the clinician. When there is plenty of pus, a liberal supply should be taken, at least sufficient to insure that it will still be moist by the time it reaches the laboratory.

2. *Stools*.—What we have said concerning pus, is equally applicable to stools. A matter of only a few hours from the time a stool is passed until it is cultured may be sufficient to allow for

such a multiplication of non-pathogenic bacteria as to make the task of isolating the offending organisms absolutely hopeless.

3. *Blood smears*.—Here again, a little more care on the part of the clinician in preparing his films would frequently result in more satisfactory reports being sent out. Every now and again we receive blood films on slides which have not been properly cleaned, and, what is worse, films that have been prepared, not by drawing out the drop of blood with another slide, but simply by smearing the drop around on the slide with the finger. Such films while occasionally furnishing a spot that gives some information are usually of very little value.

4. *Blood cultures*.—This is one phase of laboratory work which requires most painstaking care, if the results are to be of any value whatever. Personally, I always hesitate to give a report on blood cultures which have been taken outside, and sent in to the laboratory. Although the clinician in taking the culture may use what he considers to be good surgical technique, the majority of these cultures prove to be contaminated. The reason for this would appear to be due to the fact that surgical technique is not bacteriological technique. Even with the utmost surgical care, the occasional organism may find its way into the field of operation, and cause no harm whatever to the patient, as the anti-bacterial substances of the body are quite well able to take care of the invader, but allow that same organism to get into a flask of broth in which there are, not only no antibodies, but the most congenial surroundings for its growth, and it will not be long before it will have multiplied to such an extent as to outgrow any pathogenic organism which may have been present. The practice, then, of sending in blood for culture is one which we do not encourage, because experience has taught us that results in many cases cannot be relied upon. It is much more satisfactory for the pathologist to go out and take the blood culture himself.

5. *Sputum*.—While this material, on the other hand, does not require so much care in its preparation, or transfer to the laboratory, at the same time a word or two of caution may not come amiss. When sputum is intended for examination for tubercle bacilli, and the specimen bottles supplied by the Department of

Public Health are used, very little of an adverse nature can happen, even although there may be some delay in reaching the laboratory; but, when it is intended for cultural purposes, or for the typing of pneumococci, or the preparation of an autogenous vaccine, care should be taken to see that the bottles used are not only sterile, but do *not* contain any preservative, and that the specimen reaches the laboratory with all speed.

6. *Material for examination for Vincent's organisms.*—This should be smeared directly on a slide and sent to the laboratory as is done in the case of gonococcal smears.

7. *Surgical material.*—Material intended for histological examination should reach the laboratory as soon as possible after removal in order that it may be examined in the fresh state, and then placed in fixative before any appreciable change can take place. When, however, there is liable to be delay in reaching the laboratory, it should be placed in 5 or 10 per cent formalin in which it will keep indefinitely. One objection to the use of alcohol as a fixative is that tissues so fixed are difficult to cut on the freezing microtome, thus interfering with a rapid diagnosis should such be desired. Another point to be borne in mind is that it is preferable to send the whole of the organ or tissue removed, when this is possible, rather than a small fragment for diagnosis, as frequently

sections have to be cut from various areas before the exact condition can be determined. Again, where only a small fragment of tissue is removed for diagnosis, care should be taken to obtain a representative portion. Particularly is this the case when a section is taken from an epithelial surface, such as the skin, tongue or oesophagus. Occasionally we have received small bits of tissue from these sources, which did not go to a sufficient depth to show the relation between the epithelium and the underlying tissues. An accurate diagnosis under such circumstances is often impossible.

These are but a few of the instances in which, we believe, the co-operation between pathologist and clinician can be improved. While many of these suggestions, however, may seem of comparatively minor importance, and may not be applicable to those present, at the same time, for the benefit of those to whom they may apply, we desire to draw attention to the fact that in the laboratory a great deal of attention must be paid to detail, if the results obtained are to be reliable. In a similar manner, we believe that greater attention on the part of the clinician to details such as we have mentioned, would tend not only to improve the laboratory service rendered to the clinician, but would also assist materially in establishing more pleasant relations between the pathologist and the clinician.

During the excessive enthusiasm a few years ago for the then newly discovered vitamins and the exalted hope of great physiologic accomplishment through their administration in a therapeutic or prophylactic way these food factors—notably the vitamin B of yeast—were often expected to “pep up” the jaded person. Somehow it was assumed that the vitamin must “stimulate” one function or another. The actual investigations have, however, been disappointing in some ways. Secretion has not as yet been discovered to be stimulated or “pepped up” in any way, although efforts have been directed to a study of the possibility, notably by Cowgill at Yale University. Deuel and Weiss of Cornell University Medical College have demonstrated

that deprivation of vitamin B does not of itself lower the basal metabolism, nor is the latter altered by large doses of vitamin-bearing products. These results were secured on dogs. Now Mitchell and Carman of the University of Illinois have demonstrated that the ingestion of excessive amounts of vitamin B up to about ten times their estimated requirements does not appreciably modify the basal heat production of rats. Therefore, so far as the basal heat production is a measure of “vitality,” it may be concluded that the ingestion of amounts of vitamin B in large excess over the minimum requirements for growth and continued well being does not benefit an animal.—*Jour. Am. Med. Ass.*, June 26, 1926.

UPPER RESPIRATORY INFECTION IN ITS RELATION TO PULMONARY DISEASE*

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THE route of pulmonary infection secondary to a sinusitis without escape of pus into the nasal chamber is by lymphatic absorption. Where the nasal passages are constantly full of pus, it is possible that inhalation may be more important than absorption. Sinusitis should be regarded as an etiological factor in subacute and chronic respiratory disease, and in all cases of this class in which the cause is not clearly known.

The following is a typical picture of a case in point. A patient may be seen with a history of chronic cough and expectoration of several years duration. Occasionally complaint may be made of catarrhal conditions in the head with the usual accompanying conditions, but seldom of sinus pain. The temperature and pulse are usually normal, although there may be a history of periodical attacks of fever suggesting those of tuberculosis. The strength, the weight and general nutrition are good in spite of the excessive cough and profuse purulent sputum. Repeated examination of sputum shows an absence of tubercle bacilli. The lung signs are for the most part in the bases of the lungs, in contrast to tuberculous infections where the site of election is in the apices.

The lung condition is that of a chronic diffuse bronchitis with or without slight or marked bronchiectasis according to the duration of the disease. The organisms most commonly found are the pneumococcus, staphylococcus, and streptococcus, although others may be present. These same organisms are frequently found along, or in combination with the pus washed from the sinuses: X-ray films of the lungs show very little compared to the physical examination, but may show considerable peribronchial thickening and calcified

tubercles which may lead one to a false diagnosis of tuberculosis, and the adoption of a course of anti-tuberculosis treatment which fails in securing beneficial results. In the above cases, the response to drainage of the sinuses and to the eradication of focal infection is of marked therapeutic value. Early or latent sinus infection should be constantly sought for and properly treated, as a means for the prevention and amelioration of these insidious non-tuberculous diseases of the lung.

In addition to infection of the sinuses acting as an etiological factor in non-tuberculous affections of the chest, there is a large group of cases of rhino-pharyngeal affections, especially those of an obstructive type, which may produce symptoms that may simulate those of tuberculosis. An obstruction of the upper respiratory tract, in the nose or nasopharynx, has a mechanical action. The patient whose nose is blocked cannot breathe through the natural way, but must breathe through the mouth. He therefore introduces directly into the bronchial tract air which is often cold, and has not been moistened or filtered through the nasal filter.

As a result of disease, the highly specialized epithelium in the nasal passages—the ciliated cells—are replaced by squamous cells, and the efficiency of the nose as a protective organ is impaired. In a normal functioning nasal passage, few organisms reach the tracheal passage in a viable condition. If, however, there is a partial nasal obstruction with a stasis of secretions, or if the infected discharges are draining into the nasal cavities from the conjunctivæ, the accessory sinuses or middle ear, the nasopharynx, the pharynx, the tonsils and the larynx are constantly bathed in a discharge that is irritating and that contains bacteria. Thus the resistance of the normal tissues is

* Read before the Ontario Laennec Society.

reduced and they become more liable to infection.

Improper breathing as a result of abnormal variations in the nasal passage causes insufficient expansion of the alveoli of the lungs. The apices, the least mobile portions of the lung, do not expand properly. Physical signs such as diminished tone, diminution of vesicular breathing at the apices should not be a reason for premature diagnosis of disease of the lung. But, before one interprets these physical signs one should investigate whether there are any deviations from the normal physiology of breathing. Chronic nasal obstruction alone without sinus infection is capable of producing persistent coughing, and, in addition to this, when there is infection of the sinuses or bronchial infection there will be abundant sputum.

Those of us who have had some war experience will recall a number of cases of tuberculosis referred to medical officers, which proved after thorough examination to be non-tuberculous, and after careful search many of them were due to a focus of infection in the rhinopharynx. These chronic nasal obstruction cases, particularly in soldiers who were exposed to damp weather, contracted a cough with expectoration which lasted for some time, and which proved on repeated examination to be non-tuberculous. These cases were called by the French "bronchitis of damp feet and obstructed noses." In private practice and in our large tuberculosis clinics we are all familiar with a number of patients who are chronic coughers and have regular attacks of bronchitis and who fear they have tuberculosis. On investigation we are able to prove its absence and find very often the cause is due to some rhinopharyngeal affections.

Sir Wm. Osler stated in 1917 that many hospital beds in France and in England were occupied by soldiers with flat chests, and by many who were mouth breathers. He warned the medical profession to avoid sending such men to the front, as he stated it was these recruits that soon developed, when exposed to severe strain and damp weather, symptoms similar to those of tuberculosis and soon found themselves on the regimental sick list. Col. Sergeant, consultant to the French Army, stated that incorrect diagnoses has been made in one-

third of the cases of supposedly tuberculous soldiers, and that these, on more careful investigation, proved to be chronic bronchitis with a primary focal infection in the rhinopharynx and accessory sinuses. Dunham and Skavlem report that of 389 cases referred to them by clinicians as tuberculosis, 28 per cent were found to arise from foci of infection by other organisms; the primary focus in a vast majority of cases being in the head.

1. Twenty-five cases of bronchiectasis (secondary to infected antrum and ethmoids.)
2. Forty-two cases of apical catarrh (secondary to infected antrum, ethmoids, tonsils, teeth.)
3. Eighteen cases of unresolved basal pneumonia (secondary to infected antrums, frontals, ethmoids, or following influenza.)
4. Twenty-one cases of inactive pulmonary tuberculosis complicated with active nasal sinus infection.
5. Two cases of mitral stenosis.

The differentiation calls for co-ordination of every clinical and laboratory test available, together with properly interpreted chest plates, and with evidence obtained from chest specialist, dentist, and rhinologist. And here I would like to state that it is very unwise to base an opinion on a single set of x-ray plates; one should have several series taken at different intervals and study them all before giving a definite opinion regarding the pathological changes in the lung and the diagnosis.

A survey taken in an important sanitarium in the United States of a large number of undernourished children reacting to the von Pirquet's test showed that they were suffering from mouth, nose and sinus infections. One can easily realize that a patient cannot get full benefit of anti-tuberculosis treatment, until all points of focal infection are eradicated. The exacerbation of a latent sinusitis in pulmonary tuberculosis may retard the progress of the patient toward the arrest of the disease.

I have observed many times in examinations of the larynx a streak of pus running down between the arytenoids into the trachea from the postnasal region, arising from an infected ethmoid. This obviously is a common cause of coughing when your patient is awake. Sometimes a patient learns to swallow the discharge and thus no cough is produced. One

must not forget that a latent sinusitis and some other affections of the rhinopharynx can be tolerated for a long time without any obvious inconvenience to the patient, and his attention may only be drawn to this state of affairs by an acute exacerbation following a systemic depression such as chilling of the body, under-nourishment, mental and physical exhaustion, misuse of alcohol and tobacco, debility from old age and other constitutional diseases. The resistance of the host is lowered by the above conditions, and pathogenic bacteria lying latent in the sinus, nasopharynx, and pharynx acquire new virulence and induce symptoms simulating tuberculosis.

Physicians who are familiar with all the processes of diseases that go on in the lungs and pleura, in eagerness to solve problems connected with respiratory system may overlook what takes place in the vestibule of these organs in that complicated, delicate, vulnerable system, the nasal passages, and the cavities depending upon them and opening into them. One cannot ignore these upper passages without the liability of making a gross error in regard to other portions of the respiratory system. In a majority of cases of chronic coughers, the chest is generally thoroughly investigated without any careful examination being made of the nasal passages or accessory sinuses. This, I consider, a serious oversight; one should adopt it as part of a routine examination to have the nasal and pharyngeal tract thoroughly investigated, in all cases of chest disease. There are many affections from the tip of the nose to the larynx that may cause cough.

Allow me to recall to your mind a few diseases of the respiratory tract which have cough or discharge as common symptoms and which should be sought for in non-tuberculous affections of the chest. (1) Adenoid vegetations. (2) Diseased tonsils. (3) Congenital narrowness of the nasal passages. (4) Collapse of the *alae nasi*. (5) Hypertrophic rhinitis. (6) Atrophic rhinitis. (7) Hyperplasia. (8) Chronic ethmoiditis. (9) Chronic sinusitis of maxilla, frontal and sphenoid. (10) Polypi of the nasal passages. (11) *Ozena*. (12) Spurs, deviations and ridges.

Most nasal affections are chronic in character, or created by conditions favourable to chronic affections. Once the acute state has been

passed the affection goes on indefinitely without other inconvenience than an intermittent coryza. One of the most important reasons why these diseases are overlooked, is because they are well tolerated by the patients subjectively. The patient may suffer from an infection of the nasopharynx for some time without seeking advice for it, while at the same time the condition causes pathological changes and symptoms in other parts of the body. All of us know of a number of people, who have marked nasal obstruction, abundant post-nasal discharge, who breathe exclusively through their mouths, and go about their work month after month without paying particular attention to it. They may complain of often catching a cold in the winter and spring, which lasts for some time, the reason for which they cannot understand. The persistent cough, and perhaps occasional streaks of blood may alarm these patients with the result that they have their chest examined. Habitual cough may be the only symptom in chronic nasal disease.

The rhinopharynx has a rich blood supply. The pharyngeal branches of the Vidian and pterygo-palatine arteries anastomose with the ascending pharyngeal, and the veins empty into the pterygoid plexus. There are accordingly many sources from which bleeding in the mouth may arise and simulate pulmonary hæmorrhage: 1. Spontaneous bleeding from the rhinopharynx may take place from enlarged and congested adenoids. 2. Superficial, non-specific ulceration on the anterior third of the septum is one of the most common sources. 3. Ulceration in the posterior nares or nasopharynx, secondary to a coryza or nasopharyngitis. 4. Spongy gums associated with pyorrhea alveolaris in adults, and carious molar teeth in children. 5. Enlarged veins around the base of the tongue is a fairly common source of bleeding in gouty persons. 6. Vicarious menstruation; new growths and œsophageal varices. 7. Foreign bodies. Tuberculous lesions, however, must always be borne in mind.

The rhinopharyngeal and pharyngeal walls are richly supplied with lymphoid tissues which become quickly enlarged and congested in nasal infection, producing a condition known as granular pharyngitis. These lymphoid follicles on the posterior wall respond readily

to the influence of an infection higher up in the rhinopharynx and accessory sinuses. This granular condition is also a frequent cause of an irritative cough and a tickling sensation in the throat. The only way to properly treat this condition is to remove the primary infection above and the lymphoid enlargements will disappear on their own account, if they have not already become diseased.

Descending infection causing pharyngitis, tonsillitis, laryngitis, as well as a descending bronchitis may all be secondary to an infection of the nasal passages or accessory sinuses. Of course there are some bronchial conditions secondary to diseases, such as typhoid fever, scarlet fever, nephritis, cardiac lesions, tuberculosis, or emphysema. It is important, of course, in making a differential diagnosis to exclude all possible systemic causes of bronchial disease.

The types of bronchitis of nasal origin are mainly chronic and very often recurrent for the good reason that the pathological condition of the nose is also chronic. Very often a patient who has a chronic cough may have no sign of bronchitis whatever. The infection may not go further down than the larynx and there may be a total absence of all physical signs in the

chest. This absence of signs in the chest may perhaps give rise to doubt on the part of the examiner as to whether some pathological process, not evident at the time of the examination may not be present, and his patient may be placed under observation as a case of suspicious tuberculosis. Various influenzal epidemics are the most fertile cause of acute accessory sinus infection; this subsides leaving some infection as a sequela, which in time becomes a chronic focus of infection.

In the relationship between sinus and lung infection it must be emphasized that the cure of an infected sinus does not always immediately cure the broncho-pulmonary disease. The cure will depend on how far the process has gone in the secondarily diseased region. If this secondary trouble is recent, and if the primary sinus infection is removed, re-infection will certainly be prevented and recovery will take place. But where there has been long established secondary pathological changes, such as bronchiectasis, the eradication of the primary sinus infection, no matter how thorough, will not cure this chronic condition but the eradication of the diseased primary area will improve the condition of the patient.

Advanced Meningococcus Meningitis.—Max Minor Peet, Ann Arbor, Mich., emphasizes the value of ventricular and cisternal punctures in advanced meningococcus meningitis, and cites a typical example of the complication of ventricular and spinal subarachnoid blocks. It was an advanced case of meningococcus meningitis with complete recovery and no evidence of hydrocephalus over two and one-half years later. Peet says that the treatment of meningococcus meningitis by the lumbar route alone has given satisfactory results only in the presence of the most favorable conditions—early diagnosis, specific serum and low or moderate virulence of the organisms. Many patients discharged as cured are found on follow-up examination to have hydrocephalus indicating a cisternal, ventricular or cortical subarachnoid block, which had not been recognized and therefore not treated. Puncture of the cisterna magna is indicated in all cases

not showing satisfactory progress. The technic is not difficult, but should be thoroughly mastered on the cadaver before application to the living subject. Antimeningococcus serum introduced by cisterna puncture reaches the basilar cisterna and cerebral subarachnoid spaces in greater concentration, whereas, serum introduced by lumbar puncture barely reaches the cisterna magna. Cisterna puncture, therefore promises the maximum distribution with the maximum concentration in the regions first involved. Block of the spinal subarachnoid space may be prevented by early cisterna puncture. The presence of such a block makes this procedure imperative. Ventricular puncture, either through the anterior fontanel or in older children through a trephine opening, has proved a valuable means of treating meningococcus meningitis.—*Jour. Am. Med. Ass.*, June 12, 1926.

A DISCUSSION OF NEISSER INFECTION IN THE MALE

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THE diagnosis of Neisser infection in the male is simple theoretically but practically it appears to be difficult at times. There are many cases with purulent urethral discharge and history of recent exposure in which no gonococci are demonstrable, and which clear up in a few days under mild treatment or no treatment at all, without manifesting any of the symptoms of acute gonorrhœa.

The most frequent causes of non-gonorrhœal urethral discharges are: 1. Infection by various organisms other than the gonococcus. These infections are often contracted from women who have leucorrhœa, and who are especially apt to be infective just after the menstrual period when the numbers of bacteria in the vagina are at the highest. These organisms are usually: staphylococci and streptococci, bacillus coli communis, pneumococcus, diphtheroids, micrococcus cœruleus albus, micrococcus pyogenes aureus and the diplococcus magnus of Rosenthal. These infections of the urethra while not specific require treatment, as they often cause complications such as posterior urethritis, prostatitis, etc.

2. Chemical irritation from the prophylactic injection of silver salts such as argyrol and protargol and also oxycyanide of mercury. These drugs frequently cause a very definite purulent discharge and are a great source of prestige to the unscrupulous practitioner.

3. Irritating articles of food and drink. For example, spirits containing a high percentage of fusel oil will sometimes cause a purulent discharge which soon disappears without treatment. Asparagus, strawberries, and cress have been known to act in a similar manner as also do certain drugs such as cantharides, potassium nitrate and also occasionally potassium iodide and the arsenical preparations.

4. Discharges due to a damaged urethral mucous membrane. It frequently happens that very strong solutions of various chemicals are used

as injections or irrigations, and these cause the normal columnar epithelium of the urethra to be destroyed and replaced by squamous epithelium. This epithelium is not very resistant to infection and often gives rise to a purulent or serous discharge from causes which would not affect a normal mucous membrane. One often sees cases which have an intermittent slight mucoid discharge which occasionally contains a few leucocytes and organisms (not gonococci) and on examination no active lesion of the genito-urinary tract can be found, but areas in the anterior urethra can be seen through the urethroscope to have lost their normal lustre and become greyish white instead of pink in colour. In these cases there is always a history of a long-continued treatment with powerful injections for a previous urethral discharge. This squamous replacement is, of course, permanent and this should be carefully explained to the patient who is very apt, if not informed as to the true nature of his condition, to make the rounds of all the quacks in his community who will prescribe ever stronger astringents and caustics in the vain hope of stopping the discharge. The term "gleet" is often applied to this condition, as to every other chronic discharge gonorrhœal or otherwise, and is of course, not a separate pathological condition, but only a symptom common to several widely different pathological conditions.

Aside from these non-gonorrhœal urethritides we have true gonorrhœa due indubitably to Neisser's diplococcus. There are many different strains of this organism and many varying grades of virulence, but as a general rule a first infection presents a fairly typical picture and the symptoms are usually quite acute. The cases which are "torpid" and run a quiet course generally give a history of a previous infection, in which case the patient is as yet more or less immunized by his pre-

vious attack or, as is often the case, has a chronic focus in his prostate or vesicles which has come to life again.

Many cases report for treatment with a moderate amount of purulent discharge, which contains a few gonococci, with a history of recent exposure, over-indulgence in alcohol, and one or more previous infections. It is often difficult in these cases to determine at the beginning whether they are fresh infections, or recurrences of old ones, and this point is often of considerable importance, especially if the patient is married and has not been exposed extra-maritally. The situation is further obscured because of the practice of most medical men of accepting the cessation of discharge, and the clearing of the urine as conclusive evidence of cure, whereas if the canal and prostate were examined foci of infection would often be found to be still present. To clear up the diagnosis, the two-glass test is very useful, though not by any means infallible, after which the urethra should be thoroughly flushed with a mild antiseptic such as oxycyanide of mercury 1-10,000 and a smear obtained from the prostate and vesicles by massage without squeezing the urethra. The presence of pus in this smear in an early case of this type is practically conclusive evidence of an old focus of infection in the prostate or vesicles or both, and in addition it is often possible to detect gross changes in these organs such as enlargement, presence of nodules, hardness, immobility, etc. In addition to the above, the anterior urethra should be carefully examined by the urethroscope, as soon as the acute symptoms, if any are present, have subsided to detect the presence or absence of collections of pus in the follicles and lacunæ. The great majority of cases of this type will be found to have foci of infection in the prostate, and the pus from these foci causes infection of the urethral mucosa on very slight provocation or none at all.

As regards treatment. I will not dwell on prophylaxis or abortive treatment beyond saying that the former appears to give excellent results if carried out within a few hours of exposure, although statistics are hard to obtain on account of the difficulty of ascertaining whether the woman concerned has been infected or not. During the war, however, it

was found that proper prophylactic treatment carried out within three hours of exposure was an almost certain preventative of gonorrhœa.

Abortive treatment has many enthusiastic exponents in the literature; many claim to be able to abort 80 to 90 per cent of acute infections, if treatment is begun during the first day of the discharge. Many different methods are employed: Diday, Ricard and Englebreth used silver nitrate from 1 to 5 per cent, Bettman uses 10 per cent protargol, Cabot 10 per cent argonin, while Janet uses irrigations of 1-1,000 potassium permanganate solution which is said to give 87 per cent of cures. The most popular method appears to be that of Ballinger who injects 5 per cent argyrol in the urethra and seals it with collodion. This is retained for six or seven hours or until the patient is forced to urinate. This is repeated daily for five or six days. None of my colleagues nor myself have had, as far as I am aware, any experience with these methods because, if they fail to abort they greatly aggravate the condition and we feel it is wiser on the whole to adopt more conservative methods.

There are certain points in the treatment of acute gonorrhœal urethritis on which all are agreed; the first being *rest*. The more complete the rest the more favourable the course of the disease other things being equal. Unfortunately, under the conditions of civil life, it is not often possible for the patient to stay in bed, but during the war when it was possible to keep infected soldiers in bed on a light diet, the results were very good.

Also, on the question of *diet* there is practically unanimity of opinion that alcohol and rich or stimulating foods are injurious; also, that the drinking of large quantities of water is beneficial.

It is when we come to the question of active systemic and local treatment that we meet with extremely divergent views. Many men use only internal medication and regard local treatment as injurious. They give the ordinary "urinary antiseptics" such as the balsams, sandalwood oil, salol, urotropin, methylene blue and also diuretics and antacids such as the citrates and acetates with hyoseyamus and belladonna in almost endless combinations. For the writer's part, but he does not expect everyone

to agree with him, he thinks that these drugs are of little practical value in gonorrhœa, with the exception of the acetates and citrates with hyoseyamus or belladonna in very acute cases to relieve the pain and burning on micturition. The other internal medicaments do more harm than good, in my opinion, by upsetting the patient's stomach, so preventing him from using the only medicine that is of much service; namely—water. Water given in large quantities, all that can be borne, is certainly highly beneficial in these cases. The more frequently the canal is flushed the better, and the urine when highly diluted is rendered less irritating. In so far as the balsams and essential oils increase the flow of urine they are beneficial, but if one drinks a great deal of water, the excretion of urine is bound to increase, so the aid of a diuretic is not required excepting in those with impaired water elimination, and these cases are rather exceptional, and do not affect the question at issue materially. It is not reasonable to suppose that a drug taken by mouth, diluted by the stomach contents, absorbed and diluted by the blood and then excreted by the kidneys during which process it is again diluted by the urine can have any actual bactericidal value; but apart from this, during the past eighteen months a series of tests have been carried out at the Montreal Dispensary. One group of one hundred were given urinary antiseptics such as salol, the balsams and sandalwood oil, and another group of the same number no medicines by mouth whatever, both groups receiving the same local treatment, and there was no appreciable difference in the end results, both groups averaging about the same as regards the duration of the disease, the severity of the symptoms, and the frequency and nature of the complications. It would seem therefore that the clinical value of the urinary antiseptics lies chiefly in their effect upon the mind of the patient; in other words they are to a great extent a mere placebo.

As regards the *local treatment of the urethra*, it is impossible to get any degree of unanimity whatever, as every one seems to have different views, and the literature teems with accounts of all sorts of drugs for treating the urethral mucosa. For the writer's own part he believes there is little virtue in the ordinary small urethral syringe no matter what drug is em-

ployed. The anterior urethra is a collapsed tube and the walls are in longitudinal folds. The ordinary injection with a small syringe, without hydrostatic pressure within the canal, merely finds its way along the "central figure" of these folds, where the resistance to its passage is least, and leaves the rest of the mucosa undilated and uncleansed. If, however, hydrostatic pressure is obtained by means, say, of the gravity irrigator, the urethra is ballooned out, and the irrigating fluid is forced into all the recesses and folds of the mucosa.

Janet of Paris was the first to advocate this method of treatment and he considered that irrigations with potassium permanganate was the most suitable treatment for the majority of cases of gonorrhœa.

His method was to thoroughly wash the anterior urethra filling it gently, and allowing it to empty itself a dozen or more times, and then to allow the stream to flow past the compressor urethræ through the posterior urethra into the bladder. He advised copious irrigations at about 115° F. and a gradual increase in strength from 1-8,000 to 1-4,000. He found that if the patient could be irrigated twice a day in this manner and induced to drink a great deal of water the results were surprisingly good without giving any other treatment.

Everyone will not agree that the posterior urethra and the bladder should be irrigated in a case of anterior urethritis, but Luys is most insistent on the importance of this point. He says: "In acute gonorrhœa irrigations are only of value if they pass along the whole channel. There is no occasion to fear that the bladder or posterior urethra can be injured by the anti-gonococcal solution which enters it. It should be our endeavour in every case without exception, even when there is no sign of a posterior urethritis, to get the fluid to run into the bladder. The risk of thus infecting the deep parts of the passage exists only in the imagination of certain people. If the liquid carries with it some gonococci they are so much more exposed to its action and cannot fail to undergo destruction."

As far as my own experience goes I find that urethro-vesical irrigations twice a day if begun very early in the disease before the gonococci have become entrenched within the mucous membrane, almost always effect the

immediate stoppage of the purulent discharge, which is replaced by a profuse discharge of straw-coloured serum soaking the dressings several times daily. This gradually subsides, and, if no complications develop, in a few weeks the canal has returned to normal.

Potassium permanganate was chosen by Janet as the drug of choice for irrigating the urethra on account of its almost specific action on the gonococcus. It is certain that this action is not due to its antiseptic power, which is insignificant in solutions of less than 1:1,000. It is thought that its action is due to its power of constricting the mucosa and causing what Janet terms a "serous reaction" i.e., a mild oedema and a brownish urethral secretion. He thinks that the constricting effect tends to empty the glands of Littre and the lacunae of Morgagni while the "serous reaction" renders the mucosa unsuitable soil for the gonococcus.

The chief complications in the anterior urethra that keep up the purulent discharge are the infection of Littre glands, of the lacunae of Morgagni and the formation of subepithelial cellular infiltrations. All that any drug can do is to keep the general surface of the mucosa cleansed and it is extremely improbable that the much vaunted penetrating power of the silver albuminates really gives them the power of destroying intra-cellular organisms, much less the power of reaching and destroying the organisms in collections of pus in the follicles and lacunae. As long as these are present they keep emptying at varying intervals on to the urethral mucosa re-infecting it and keeping up the discharge. To deal with them surgical measures are necessary i.e., they must either be expressed by means of massage on a sound or by Kollman's dilator, or best of all, they can be cauterized through the operating canula of an air-dilating anterior urethroscope such as Wyndham-Powell's. Silver nitrate fused on a slender probe is frequently used for this purpose, or the electric cautery can be employed. One great advantage the cauterization through the urethroscope possesses over the other methods is that the general mucosa is not interfered with and if only one or two follicles are dealt with at a time there is very little irritation to the canal as a whole. It can thus be used much earlier in the disease than the other methods which often cause an acute

recrudescence of the disease if used too early.

Infiltrations are best dealt with by means of the four-bladed anterior urethral dilator after the discharge has stopped. It is the practice of many men to pass metal sounds as a routine measure in all cases of urethritis. At the Montreal General Hospital every case is examined with the urethroscope and if no lesions are found the canal is not interfered with.

In any case there is very little dilatation to be obtained from a metal sound or bougie. The shaft of the sound is its largest part, whereas the meatus is the narrowest part of the urethra; hence it is obvious that any sound that will pass the meatus is too small to dilate the canal. The only remedy for this is to do a meatotomy in every case and this is not always feasible nor wise. The dilator, on the other hand, does not dilate the meatus at all since the blades begin to open well within the canal and if the meatus will admit an F22 sound there is no reason for stretching it or doing a meatotomy.

Involvement of the posterior urethra occurs in the majority of cases. It may be a very mild infection which soon clears up under the routine urethro-vesical irrigations and with little or no resultant prostatic involvement. Or it may begin very quietly and insidiously and gradually cause extensive prostatic infection which may go on to abscess formation. Or again, it may begin as an acute posterior urethritis with frequent, urgent, sometimes painful micturition and terminal hæmaturia.

There is not space in a paper of this kind to enter into a detailed account of the treatment of all the complications of gonorrhœa, but it may be said in general that the very acute posterior cases should not have local treatment but should be confined to bed, given warm rectal salines and opium and belladonna suppositories. The prostate is practically always involved in these cases and as long as the gland is very tender on pressure it should be left alone. If abscess develops it frequently ruptures into the posterior urethra, though it sometimes must be drained through a perineal incision.

After the acute symptoms have subsided the posterior urethra should be carefully inspected

by one of the water-dilating cystourethroscopes and any local conditions such as hypertrophy of the verumontanum, infiltrations of the canal, presence of polypi, etc., noted and dealt with by cauterization, instillations, dilatations, and if there is pus in the prostate and vesicles which is nearly always the case, regular massage of these organs should be undertaken.

Catheterization of the ejaculatory ducts and opening up the vasa deferentia for the purpose of injecting the vesiculæ seminales in cases of chronic involvement of these organs has been described but these practices have not become popular as yet; to say the least, apart from the mechanical difficulties, the value of these procedures is very doubtful and it appears to be a case of the cure being worse than the disease.

Of electrotherapy, i.e., electrolysis and diathermy, very little can be said here. They have not been received very enthusiastically by the profession so far and they sometimes produce very poor results. About eight months ago I was consulted by a patient who had been treated in New York by diathermy. About an inch of the mucous membrane of the anterior urethra had been completely destroyed and the roof of the urethra at this point had a very marked

peri-urethritis which on healing involved the corpora cavernosa in its fibrous contraction. A long-continued course of dilatations has kept the canal patent but the fibrosis of the corpora cavernosa prevents the complete erection of the organ and this will be permanent. In view of this case and others more or less similar one must conclude that these methods do not produce any better results than the older methods of treatment and sometimes cause catastrophes which did not occur under those older methods.

Vaccines have on the whole proved disappointing. They have been tried out quite thoroughly in many clinics, as well as privately, and it can be safely said that they have no value in urethral or prostatic conditions, acute or chronic. They may have some value in joint, testicular and eye complications or in affections of the nervous system. These last named complications do occur occasionally as shown by the fact that the cerebro-spinal fluid frequently gives a positive gonococci complement fixation test and a negative Wassermann test in nervous conditions, which have heretofore been regarded as syphilitic in origin.

These questions, however, lie outside the scope of this paper and will be left for discussion at a later date.

Ankylosing Operations on the Tuberculous Spine.—As a basis for his study, Leonard W. Ely, San Francisco, has collected the histories of the patients with tuberculous spines who were operated on in the orthopædic clinic of Stanford University during the last twelve years, and to them has added the histories of his private patients. There are those who think that they can cure spinal tuberculosis by exposing their patients to sunlight. Until about twenty years ago the nonoperative treatment, by plaster of paris, by braces and by frames in recumbency, was practiced almost universally by those who treated many cases of spinal tuberculosis. The main rule of treatment is to deprive the joint of function. The nonoperative treatment is uncertain, takes years of time at best, and almost always is followed by marked deformity. In the operative treatment, all the work is done on healthy bone, and at a consider-

able distance from the tuberculous portion. Hence, no danger of secondary infection exists. There remains, then, only the direct risk of the operation. This is very real without a skilled anæsthetist. With one, it is almost negligible. The patient should be anæsthetized on his face in a comfortable attitude, with cushions arranged so that his breathing will be unimpeded. When the operation is finished, the patient is rolled carefully onto the ambulance, and remains flat on his back for about a week before his wound is dressed. He is kept in recumbency for six weeks, though he may lie on his side or on his face after the first week. After this, he wears a spinal brace for about six months. The Hibbs operation theoretically is better than the Albee, for the bony bridge, once formed, is permanent, while anything may happen to a graft, sooner or later.—*Jour. Am. Med. Ass.*, June 5, 1926.

WHAT ANÆSTHESIA RECORDS SHOW*

By J. A. BLEZARD, M.D., C.M.

Edmonton, Alberta

MY FIRST records of anæsthesia were begun about eight years ago, and, although decidedly incomplete, they proved of sufficient interest to make me strive toward better ones.

The record cards I now use are of pocket size, printed on both sides—one of which is used

and the amount of special care necessary. For example, a patient with a valvular lesion and good compensation will usually stand an operation well, whereas one with myocardial degeneration, such as is associated with toxic thyroid

Hospital	Date			Name		
No.	Word			Age		
Lungs	Throat			Urine		
Heart	Teeth			Pre-op		
B.P.S.	Risk A B C			S		
D	Depr. 1 2 3			A.		
Diag.	Prep.			Acct.		
Pre. Hyp.	Time			Conscious		
Vomited	Consciousness			Med.		
Med.	Fee			Paid		
Surgeon	Assistant			Anæsthetist		

FIG. 1

for pre-operative and post-operative notes (Fig. 1), the other (Fig. 2) for charting the blood pressures, pulse and respiratory rates, steps in the operation, anæsthetic used and medication necessary while the patient is on the operating table.

Pre-operative examination of patients is made when possible. I also watch their recovery throughout their stay in the hospital and make notes on their progress. From these records, the following observations are made:

INFORMATION RECORDED ON THE CHART

Lungs.—Pre-operative examination should always be made. From 50 to 75 per cent of those developing lung complications after operation showed signs of pulmonary disease at the examination before operation.

Heart.—Careful examination may show valvular lesions or muscular weakness, and the knowledge of their existence may be of great value in the estimation of the patient's reserve power, and may guide the anæsthetist in his advice to the surgeon as to the extent of operative procedure which may be safely undertaken

Time	AS	AE	OS	PULSE		RESP.		B.P. S A		V

Dose										
Skia										
Eye										
180										
160										
140										
120										
100										
80										
60										
40										
20										
0										
Remarks	EC	E		ANÆSTHETIC & AMOUNT N. O. D.						

FIG. 2

disease, may not show as much, or any, valvular disease, but may be a poor subject for anæsthesia or any prolonged surgical procedure.

Blood pressures.—Systolic, diastolic and pulse pressure should be taken previous to the day of operation, on the table before the anæsthetic is started and every few minutes during the operation. These readings are usually lower when taken in bed before operation than when taken on the operating table. In a nervous patient the blood pressure is likely to be higher than normal before the anæsthetic is begun. An occasional patient will show a lowered blood pressure when coming to operation, due to the pre-operative hypodermic of morphia given in the ward.

Throat.—Enlarged tonsils, enlarged thyroid or nasal obstructions may and do influence greatly the administration and the conduct of the patient under the anæsthetic. The first essential for good anæsthesia is an efficient airway and this should be maintained, if at all possible. This is effected in several ways: usually, merely keeping the chin well forward will suffice; in other cases, with throat obstruction or without teeth, an artificial airway is needed; occasionally nasal tubes are required. Snoring during anæsthesia is not necessary in the great majority of

* Read before the Alberta Medical Association, October 16, 1925.

cases, and its presence without any attempt at relief, signifies inexcusable carelessness on the part of the anæsthetist.

Teeth.—The mouth should be clean, and in cases other than emergencies, septic tonsils, dental caries and pyorrhea, should have the attention of a throat specialist, dentist and nurse before major operative procedures are undertaken.

Temperature.—In about half the cases the temperature at the time of the patient's return is lower than it was when he left the ward. This is most evident with ether, and least with gas-oxygen anæsthesia.

Urine.—Urinalysis not only reveals clinical facts that have a bearing on the choice of anæsthetic, but a comparison of the urine before and after operation frequently shows changes attributable either to the operation itself or to the anæsthetic used.

Diagnosis.—The accuracy of the diagnosis materially affects conditions in anæsthesia. When a comparatively simple operation has to be extended to afford the surgeon time and opportunity to correct an error in diagnosis and institute changes in the operative treatment, anæsthesia is prolonged unduly and the safety of the patient, both at the time of the operation and during his convalescence, needlessly risked.

Preparation.—Limitation of catharsis pre-operatively markedly reduces the likelihood of intestinal distension, with the excessive handling and annoyance to the surgeon that distension entails. No cathartic should be given for twenty-four hours before an abdominal section. An enema at night and in the morning is usually sufficient. The administration of an alkali, such as sodium bicarbonate, plenty of liquids, carbohydrate in the form of sweet drinks, sweet foods, or even good candy, unless contraindicated by the condition present, for a day, or days, before operation, is of service in preventing shock and post-operative acidosis.

The administration of digitalis for cases of auricular fibrillation, or myocardial weakness associated with toxic thyroid disease, or an infection of the genito-urinary tract is very often salutary, since it augments the patient's reserve at the time of operation.

The administration of atropin, when ether is to be given, lessens the secretion of mucus, and tends to a smoother anæsthesia. Morphin lessens nervousness and the amount of anæsthetic neces-

sary. These should not be given as a routine, but ordered especially for each patient. Large doses of morphin in susceptible patients may cause marked respiratory depression with poor aeration and relaxation.

Record during operation.—The other side of the chart is used for recording incidents during the administration of the anæsthetic and the operation. At this stage, the object is to combat shock and to return the patient to the ward with as little reaction from the anæsthetic, and the operation as possible. All means should be taken to prevent shock and to treat it if it develops. Only then will the anæsthetist's estimate of the patient's condition and his own services be worth what they should be to the patient and surgeon. He should be prepared to administer the anæsthetic best suited to the case, and should use enough to provide the requisite relaxation for the different steps of the operation, but no more. The surgeon should have confidence enough in the anæsthetist he employs to be guided by his estimation of the patient's condition, and the extent of the operative measures to be undertaken. The surgeon should also be careful of his hæmostasis, and be as rapid and gentle as possible, since these factors are of great value in the prevention of shock.

In the top space is recorded the time at which the administration started (A.S.); the time surgical anæsthesia was established (A.E.); the time the operation was started (O.S.); and the time any other phenomena were observed or any procedures instituted.

The second line shows what anæsthetic is used. When gas-oxygen is used, this is expressed in percentage of oxygen in the mixture. The third is for recording the condition of the skin. The fourth is for recording the ocular signs.

The systolic and diastolic blood pressures are charted in continuous lines, the pulse in a heavy dotted line and the respiration in a lighter broken dotted line. The figures on the left side of the chart indicate millimeters of mercury or rate of pulse and respiration.

Blood pressure and pulse readings should be taken in all major operations as neither one is a true guide without the other. They should be taken before and frequently during the course of the operation. In operations which are likely to be of a severe character, or of long duration, an interstitial injection of normal saline given

slowly throughout the operation is of undoubted value in preventing shock.

If, during the operation, there is any marked fall of blood pressures below normal limits, the surgeon should be at once advised and an intravenous injection of saline and glucose started, care being taken not to raise the blood pressure beyond the normal level. This method may be used throughout the operation, but requires an additional assistant, and is not feasible in most of our hospitals, nor is it necessary in the great majority of cases.

If the patient is in a state of shock before operation, an intravenous injection of glucose with saline or a transfusion should be given. When the patient is markedly septic or dehydrated, insulin given with the injection will assist in the prevention of acidosis. Pituitrin is of service in many cases in maintaining blood pressures. Adrenalin may be used in emergencies, but its effect is transient.

THE VALUE OF RECORDS

It is just as true of the anaesthetist as it is of any other member of the medical profession that records are of service in helping us to improve our methods. General conclusions based on hasty recollections are too often coloured by prejudice to be of any value. By compiling the records of methods repeatedly used, one can measure their efficacy in figures. Regardless of preference, one must discard methods that are shown by fact on fact to entail undue risk or discomfort to the patient and unnecessary inconvenience to the surgeon.

Table I shows the comparative effects of ether, gas-oxygen-ether, and gas-oxygen on the urine. Even if these results were partly due to the shock of the operation, or the inevitable exacerbation of disease already present (in some cases) the records clearly show the advantage of gas anaesthesia in this regard. Under the heading "Increased Albumin" are included those cases in which there was no albumin, as well as those in which there were small amounts in the urine before operation.

TABLE I

Record of Urinalysis Before and After Operation				
Anaesthetic	No Change	Increased	Casts	Acetone
	(Per cent)	Albumin (Per cent)	per cent	per cent
Ether	48	48	11	7
Gas-Ether	44	56	4	2
Gas-Oxygen	80	18	4	1

Table II shows the incidence of vomiting after the administration of various anaesthetics. Cases in which tonsillectomy was performed, or operations on the eyes and extremities, are excluded. The records of 300 cases of operations on the head, neck, trunk, breast, abdomen and pelvis are the basis of this table.

The causes of vomiting seem to include: the administration of large amounts of ether; the use of stale ether; previous unsatisfactory anaesthesia; rough and protracted handling of organs; the use of the post-operative Murphy drip, in some cases; obstructed airway; excessive re-breathing; the presence of recently taken food in the stomach; the ingestion of acid drinks after operation; idiosyncrasy to morphine; and dilatation of the stomach.

TABLE II

Incidence of Vomiting Following the Administration of Different Anaesthetics

Anaesthetic	Vomited once per cent	Vomited two or three times per cent	Vomited for 24 hours or more per cent
Ether	33	12	6
Gas-Oxygen- Ether	20	20	10
Gas-Oxygen ...	27	6	0

ILLUSTRATIVE CASES

Case 1.—Resection of Gasserian ganglion.—Anaesthetic: Nitrous-oxide oxygen ether. Note the rather sudden drop in blood pressure after two and a quarter hours of anaesthesia. There was a great deal of hæmorrhage near the ganglion

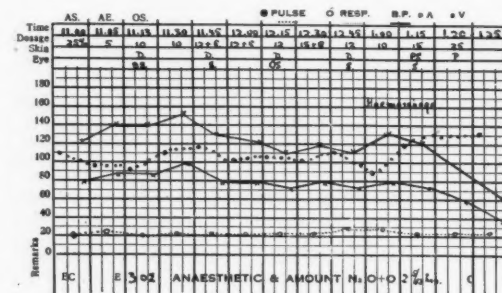


CHART I.—Resection of Gasserian ganglion.

which made dissection difficult and the surgeon was only able to divide one or two roots, but stopped when warned of the patient's condition. Recovery satisfactory.

Case 2.—Cystic adenoma of thyroid becoming toxic.—Nitrous-oxide oxygen anaesthesia. Marked myocardial degeneration. Careful preparation by rest and administration of digitalis. Liga-

tion of superior poles. Very little disturbance at operation. Four days later the patient had a marked auricular fibrillation which gradually improved under digitalis medication.

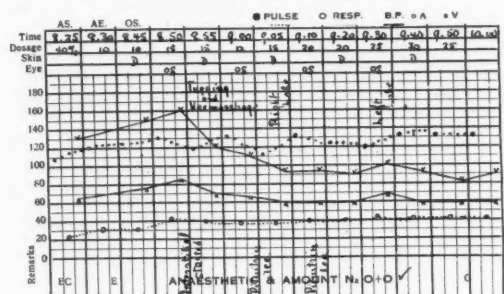


CHART IV.—Ligature and thyroidectomy.

Same patient ten days later. Nitrous-oxygen anæsthesia. Normal saline was given interstitially and pituitrin given twice because of falling blood pressure. Marked drop in blood pressure due to hæmorrhage and tugging in applying clamps. Blood pressure fair throughout. Good recovery.

Case 7.—Tuberculosis of kidney with perirenal abscess and extensive tuberculosis of the lungs.—Gas-oxygen anæsthesia. Interstitial started about the time of opening the abscess. There was a marked fall in blood pressure and rise in pulse rate during traction and clamping. There was a systolic blood pressure of 45 m.m. and

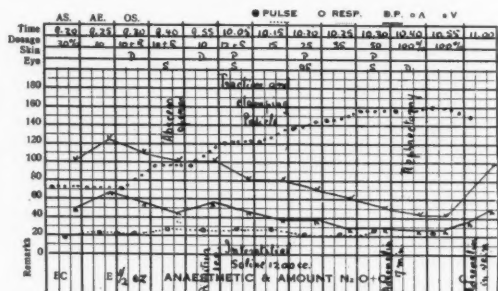


CHART III.—Nephrectomy.

diastolic of 25 to 30 m.m. for the last twenty minutes of the operation, during which time only 100 per cent oxygen was given. Pituitrin given

once and adrenalin once with no appreciable effect. After the operation was finished an intravenous of glucose 5 per cent and saline (900 c.c.) was given with rise of systolic blood pressure to 105 m.m., diastolic 70 m.m. Death occurred twelve days later, evidently from an exacerbation of the pulmonary condition.

Case 10.—Chronic appendicitis and old ulcer of the stomach.—A frail lady of fifty-four years of age. Note the low blood pressure with slow pulse and rapid respiration. It was proposed to do an appendectomy and gastro-enterostomy, but because the patient was a very poor breather

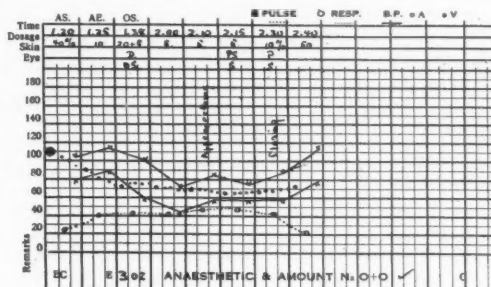


CHART II.—Chronic appendicitis and gastric ulcer.

and the blood pressure low, the latter was advised against and only the appendectomy done. Anæsthesia started with gas oxygen, relaxation poor because of poor breathing, and a change was made to ether for the intra-abdominal work with a return to gas oxygen for closing. Recovery good.

Conclusions

1. Careful pre-operative examination and preparation of the patient have a profound effect on the success of the operation and the safety of the patient.
2. Co-operation between surgeon, anæsthetist and operating-room staff are essential to the successful conduct of the anæsthesia.
3. Results can be greatly improved by the prevention, early recognition and adequate treatment of shock.
4. The anæsthetist must keep records and study them if he and others members of the profession are to profit fully by his experience.

PYELITIS IN INFANCY*

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PYELITIS in infancy is worthy of especial consideration on an occasion such as this, not because of the rarity of its occurrence or the difficulty of the diagnosis, but, because of the frequency with which the condition is overlooked.

In any unexplained fever in infancy the urine should be carefully examined. Catheterization is not always necessary in the female and is never required in the male. A fresh specimen of urine is however necessary, and a microscopic examination of this specimen for pus cells. In the male the glans should be cleansed, and the test tube fixed in position in the usual way. In the female, if it is desired to collect the specimen without catheterization, a test tube may be adapted by means of a finger of an ordinary rubber glove and adhesive, or, another method that is often successful, is the placing of a cold clean piece of oilcloth under the child's buttocks and the subsequent collection of the specimen from the oilcloth.

Except for common colds with their sequelæ such as otitis media, and the gastro-intestinal disturbances of infancy, pyelitis is one of the commonest diseases found during the first and second years.

Pyelitis may be secondary to local condition in the genito-urinary tract; *e.g.*, it is regularly present with calculi, and is frequently associated with congenital mal-formations of the kidneys or ureters, with renal tuberculosis and renal tumours. When any of these conditions are suspected cystoscopic examination should be made as has been recently emphasized by Dr. F. S. Patch.

All these forms, however, are infrequent compared with the form of pyelocystitis, which occurs apparently as a primary affection. This form of pyelitis is generally caused by a member of the colon group of organisms, and is clinically

marked by fever with pallor, and a variable amount of anorexia, although vomiting, diarrhoea and even convulsions may occasionally usher in an attack.

This form of pyelitis has been frequently referred to as a disease of the diaper age, and might even be further designated as a female disease of the diaper age, for nine out of ten cases are found in girls. There are three theories to explain the disease:

1. That it is an ascending infection through the urethra. The short female urethra explaining the more frequent occurrence in the female.
2. That infection may take place through the intestinal walls into the genito-urinary tract. This theory is based on the existence of lymphatic anastomoses between the ascending colon and the right kidney.
3. Finally the infection may take place through the blood.

Henry Helmholtz who perhaps more than any other worker in America, has concerned himself with the problems of this disease says: "The evidence thus far presented indicates that pyelitis may be caused either by the ascending or the hæmatogenous route; knowledge with regard to which infections are limited to the bladder, and which involve the entire urinary tract, is still so fragmentary, that it is inadvisable to attempt to decide which is the more likely mode of infection."

There are few diseases in which we meet with such a great difference in the severity of the symptoms. By far the most suggestive single feature is pyrexia unexplained by physical examination. A peculiar ashy pallor is another symptom frequently present. The degree of fever may vary from 101° to 105°F. and, in cases with a high temperature one is constantly impressed by the fact that the infant does not seem to be clinically as sick as the fever would indicate. However, in some instances the infant does appear very sick and often before urinalysis, cases have been diagnosed as typhoid

* Read at a symposium on the non-tuberculous infections of the upper urinary tract, at the Montreal Medico-Chirurgical Society, April 16, 1926.

fever, latent pneumonia, influenza, gastro-enteritis, difficult dentition and even meningitis, for occasionally, as aforementioned, attacks are ushered in by rigors of a convulsive nature.

Pyelitis does occur in the new-born and in this class of case seems to be just as common in the male as in the female. When an unexplained fever occurs, after the few weeks during inanition fever is likely to occur, the urine should be carefully examined for pus cells. The youngest case observed by the writer was seen in a female infant two weeks of age and reacted very quickly to the usual alkali treatment.

The following is a typical example of pyelitis: Baby B.S., thirteen months of age, normal healthy baby girl. Had always been fed carefully and under expert supervision. During August developed a slight attack of diarrhoea with pallor and temperature. The diarrhoea quickly improved, and the case was considered one of gastro-enteritis by the local practitioner. During the next two weeks an irregular fever persisted, the thermometer sometimes registering 104°F. and on other occasions 98.2°F.

The infant returned to town on August 17th, and on examination of the urine it was found to be opalescent, acid, and microscopically numerous pus cells were seen. Under the usual alkali therapy the temperature fell to normal within five days and the child improved clinically, even though the pus did not disappear from the urine for some weeks. Although recurrence is very common, to date this infant has had no relapse.

The diagnosis in practically all instances is made by examination of a fresh clean specimen of urine. Centrifugalization is not always necessary or indicated. The specimen should be well shaken and then a drop examined under the low power of the microscope.

Pyelitis unquestionably is still often overlooked; on the other hand, the emphasis that has been placed on the frequency with which it is overlooked has led many physicians to make a diagnosis of pyelitis every time they find a few pus cells in a specimen of urine, which is equally fallacious. In a normal fresh specimen of urine obtained from boys there should be no more than 2-3 cells to the low power field, and in girls 6-9. If the diagnosis remains in doubt the urinary examination should be repeated two or three times.

Treatment.—The number of drugs recommended for the treatment of pyelitis is legion. The last to arrive on the stage being hexylrescoreinol (caprocol). Autogenous vaccines and injections of foreign proteins have also had their day.

Probably the most important feature in treatment is the flushing out of the urinary passages. At the Weisenhaus in Berlin three years ago Ludwig Meyer told me he used no drugs but gave plenty of fluid in a mixture which he called "Vitamin C Mixture". This being made from oranges, carrots, and water. This process of flushing is limited only by the amount of fluid the infant will take. In well-nourished infants it is wise to materially diminish the food intake, so as to utilize the appetite for fluid intake. If necessary, on account of vomiting, fluid should be administered per rectum, intraperitoneally, or by hypodermoclysis.

Besides the use of water, the alkaline treatment has given the best results in the treatment of acute cases. Alkalies in the form of sodium citrate and sodium bi-carbonate are administered until the urine has become definitely alkaline. As a routine treatment equal parts of sodium citrate and soda bi-carbonate may be given in ten grain doses six times in twenty-four hours. The dose may be doubled each day until the urine has become definitely alkaline. Occasionally the administration of sodium citrate appears to cause diarrhoea or vomiting. Under these circumstances sodium bi-carbonate should be given alone.

Usually, when alkalization of the urine occurs the temperature becomes normal and clinical improvement is observed. The microscopic examination of the urine, however, shows little change. "No alkalinity that can be produced in the urine is sufficient to inhibit the growth of the colon bacillus. The most alkaline urine obtainable has a P.H. of 8.6 but the colon bacillus does not stop growing until 9.4 is reached. It is probable that whatever beneficial effect the alkali produces, besides its diuretic effect, is by a direct action on the tissues rather than on the bacteria." (Helmholtz)

In acute primary pyelitis therefore, symptomatic recovery is usually not difficult but no

case should be considered as cured unless two successive urinary microscopic examinations are negative.

The prognosis in this so-called primary type

of pyelitis in well-nourished infants is uniformly good. The prognosis in cases of secondary pyelitis is not so good, and as one would expect, depends on the primary condition.

A SURVEY OF THE RESULTS OF ROUTINE AND OTHER WASSERMANN TESTS IN THE TORONTO GENERAL HOSPITAL FOR THE PAST TEN YEARS*

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DURING the ten years from January, 1916, to the end of December, 1925, there have been performed in the laboratories of the University of Toronto, in connection with the Toronto General Hospital, a total of slightly over 75,000 Wassermann tests. During the year just past, 10,537 tests were made. These figures give some idea of the amount of work being done in a single department of a university hospital laboratory, and the large number of tests, in conjunction with more accurate clinical information than is possible in any other type of laboratory, should merit the attention of the medical profession as a whole, and particularly those interested in problems of public health. As a uniform technique has been employed, and the supervision has not changed during the entire period of ten years, the results should be reasonably accurate and reliable for statistical purposes. It is thought wise, therefore, to place these figures on record in the hope that other medical centres in Canada may be induced to do likewise, and in this way assist in ascertaining the truth about the prevalence of syphilis in this country.

Technique.—Since the technique employed in this laboratory has been described in the literature from time to time, and a very detailed account of it has been published in

the *Practice of Medicine*, edited by Tice¹, it is considered unnecessary to make more than a passing reference to our methods. Briefly, a cholesterinized alcoholic extract of human heart is used as antigen, with an antisheep hemolytic system and hot air incubation at 37° C. Since the latter part of 1922 all Wassermann tests have been checked by the Kahn test. This combination has proved most satisfactory.

Results of routine Wassermann tests on in-patients.—Since October 13, 1926, routine tests have been performed on practically all admissions to the public wards of the hospital. The results of these tests are shown in Table I. It will be noted that the total of 27,115 tests was almost equally divided between males and females and that the incidence of syphilis in males as shown by these tests is 7.7 per cent as compared to 5.2 per cent in the females. It should be remarked here that this table is made up entirely of patients over fourteen years of age, the infants having been computed separately, and all other children being excluded from the public wards of the General Hospital.

It is of interest to note the incidence of routine positive Wassermann tests by years. This is well shown in Chart I. There has been a general trend downward from the year 1916 to the year 1921, since which the figures have remained remarkably constant. Whether this earlier drop has been due to the inauguration

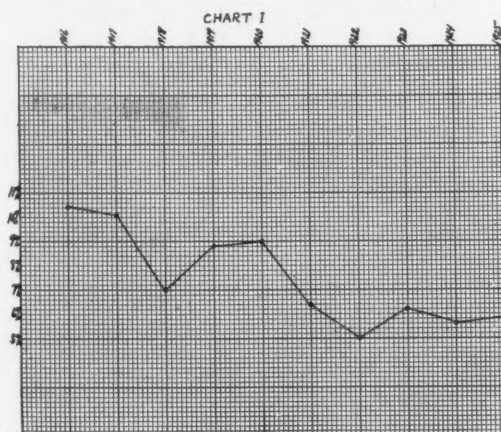
* Contribution from the Department of Medicine, and the Department of Pathology, University of Toronto. Read before the Laboratory Section, Canadian Public Health Association Annual Meeting, May 5, 1926.

TABLE I
ROUTINE IN-PATIENT WASSERMANN TESTS

Year	Male			Female			Total		
	Number	Number positive	Percentage positive	Number	Number positive	Percentage positive	Number	Number positive	Percentage positive
1916.....	(Oct. 13 to Dec. 31)						800	83	10.4
1917.....							3869	385	9.95
1918.....	2,298	143	6.2	1,091	58	5.3	3,389	201	5.9
1919.....	1,086	102	9.3	1,025	83	8.0	2,111	185	8.8
1920.....	1,175	139	11.8	1,639	116	7.0	2,814	255	9.0
1921.....	1,458	124	8.5	2,151	104	4.8	3,609	228	6.3
1922.....	1,671	100	5.9	1,718	71	4.1	3,389	171	5.0
1923.....	1,771	121	6.7	1,783	101	5.8	3,554	222	6.2
1924.....	1,869	143	7.6	2,173	84	3.8	4,042	227	5.6
1925.....	1,904	135	7.0	2,303	111	4.8	4,207	246	5.8
Total....	13,232	1,007	7.7	13,883	728	5.2	27,115	1,735	6.4

and development of the so-called Special Treatment Clinic in the Out-Patient Department, in which the ambulatory cases of syphilis

by Williams² in the Johns Hopkins Hospital in 1920, namely about 1 per cent. It should be stated here that the tests on these infants were performed on the cord blood removed by syringe immediately after birth.



are treated, cannot be stated dogmatically at this time, but such an explanation seems probable to the writer.

Table II shows the incidence of positive Wassermann tests in the new-born. These figures correspond closely to those published

TABLE II.
ROUTINE WASSERMANN TESTS IN THE NEW-BORN

Year	Number	Number positive	Percentage positive
1918	341	7	2.0
1919	382	1	.2
1920	345	6	1.7
1921	337	2	.5
1922	187	0	0.0
1923	212	6	2.8
1924	290	3	1.0
1925	385	4	1.0
Totals	2479	29	1.1

The out-patient department.—Routine tests are not made on out-door patients. In the Special Treatment Clinic above referred to, statistics based on routine tests would be misleading as to the incidence of syphilis. Important information can, however, be obtained from such a table as No. III, which shows only the *new* cases of syphilis admitted to this clinic. These figures go back only to the

TABLE III
NEW CASES OF SYPHILIS—SPECIAL TREATMENT CLINIC

	Male			Female			Year Sub-Totals			Year Totals All Types
	Primary lesion	Secondary lesion	Tertiary lesion	Primary lesion	Secondary lesion	Tertiary lesion	Primary lesion	Secondary lesion	Tertiary lesion	
1921 (5 mos.)..	17	5	64	1	6	42	18	11	106	135
1922.....	18	9	200	2	14	103	20	23	303	346
1923.....	14	22	178	0	7	108	14	29	286	329
1924.....	13	12	133	1	16	83	14	28	216	258
1925.....	26	9	150	2	4	101	28	13	251	292
Totals.....	88	57	725	6	47	437	94	104	1,162	1,360

last five months of 1921 but show a total of 1360 new cases admitted to the end of 1925. An encouraging feature of this survey is the substantial increase in the number diagnosed in the primary stage. As might be expected, the table shows that comparatively few females are diagnosed in this stage.

than 35 per cent efficient in detecting syphilis on clinical grounds.

The Hospital for Sick Children.—Our laboratory has been performing the Wassermann tests for the Hospital for Sick children for a number of years. Clinicians in that hospital found that routine tests showed an incidence

TABLE IV
WASSERMANN TESTS OUT-PATIENT DEPARTMENT
(Not including Special Treatment Clinic)

Year	Male			Female			Sex Unknown			Total		
	Num- ber	Number positive	Percentage positive	Num- ber	Number positive	Percentage positive	Num- ber	Number positive	Percentage positive	Num- ber	Number positive	Percentage positive
1920...	60	9	15.0	24	2	8.3	22	3	13.6	106	14	13.2
1921...	319	25	18.9	177	22	12.4	29	1	3.4	525	48	9.1
1922...	527	29	5.5	254	22	8.6	36	2	5.5	817	53	6.4
1923...	618	37	5.9	328	22	6.6	35	9	25.7	981	68	6.9
1924...	631	47	7.1	436	34	7.8	12	1	8.3	1,079	82	7.5
1925...	667	46	6.8	383	22	5.7	0	0	0.0	1,050	68	6.5
Total..	2,822	193		1,602	124		134	16		4,558	333	7.3

Of the remainder of the out-patient services, most of the specimens of blood for Wassermann tests come from the General Medical Clinic. Table IV shows the results from 1920 to 1925 inclusive. It will be noted that the test is being used more and more as time goes on, but it is very evident that of the large number of patients applying for treatment in the Out-Patient Department, many cases of syphilis are escaping detection because of failure to use the test more freely. This statement gains weight from the fact that in spite of careful investigation in the wards, only about 40 per cent of syphilitics are diagnosed apart from the Wassermann test. Keidel and Moore³ state that in the Johns Hopkins Hospital, no department in the Out-Patient Services was more

of only about 1.5 per cent in their wards, and consequently abandoned the test as a routine. Their actual findings which led to this decision are as follows:

WASSERMANN TESTS—INFANT WARD; HOSPITAL
FOR SICK CHILDREN*

Two years ending April 30, 1925

Number diagnosed clinically and confirmed	6
Number diagnosed clinically and not confirmed ..	0
Number suspected and found positive	10
Number suspected and found negative	14
Not diagnosed nor suspected and found negative..	1129
Not diagnosed nor suspected and found positive..	2

Total number of Wassermanns taken 1161
Total number of positive 18 = 1.5%

* This information was kindly supplied to me by Drs. Erb and Price of the Hospital for Sick Children Pathological Laboratories, to whom I am indebted for permission to use it.

TABLE V
NEW CASES OF SYPHILIS—HOSPITAL FOR SICK CHILDREN

Year	Male			Female			Sex Unknown			Total		
	Num- ber	Number positive	Percentage positive	Num- ber	Number positive	Percentage positive	Num- ber	Number positive	Percentage positive	Num- ber	Number positive	Percentage positive
1918...	33	6	18.1	27	6	22.2	205	19	9.2	265	31	11.6
1919...	105	10	9.5	95	11	11.0	132	13	9.8	332	34	10.2
1920...	788	73	9.2	703	76	10.8	119	6	5.0	1,610	155	9.6
1921...	564	17	3.1	461	26	5.6	22	3	13.6	1,047	46	4.4
1922...	814	28	3.4	701	34	4.8	32	1	3.1	1,547	62	4.0
1923...	943	34	3.6	799	40	5.1	65	5	7.6	1,796	79	4.4
1924...	849	25	2.9	672	33	4.9	68	1	1.5	1,589	59	3.8
1925...	716	22	3.0	623	23	3.6	2	0	0.0	1,341	45	3.4
Total..	4,801	215		4,081	249		645	48		9,527	511	5.4

Table V shows only the *new* cases of syphilis admitted to that institution or attending its Out-Patient Department, as detected by tests made on suspicious or evident cases, or on cases presenting difficulty in diagnosis.

Summary

In the ten years just past, over 75,000 Wassermann tests have been made in the laboratories of the University of Toronto, in connection with the Toronto General Hospital.

The incidence of syphilis in the wards of the hospital has dropped from 10.4 per cent in 1916 to 5.8 per cent in 1925. This drop has been coincident with, and may be due in part to the development of an efficient out-patient clinic for syphilis. The incidence of syphilis as shown in the routine tests in the wards of the Toronto General Hospital compares favourably with the incidence reported from similarly situated hospitals in other cities.

Only 1.1 per cent of the new-born in this hospital are found to have a positive Wassermann test. Many syphilitic mothers bear non-syphilitic children.

In the special clinic for syphilis in the Out-Patient Department of the Toronto General Hospital, more cases of primary syphilis are being detected now than in former years, but the figures for the new cases of tertiary syphilis remain so high that it becomes very

evident that efforts for the education of the general public regarding the dangers of this disease must be redoubled if the victims of infection are to be attracted to the clinics at an early stage of the disease.

Routine tests in the Out-Patient Department would in all probability enable the staff to detect many cases of unsuspected syphilis. Evidence has accumulated from various medical centres showing that clinical examination and history-taking are only from 35 to 40 per cent efficient in diagnosing syphilis in adults.

In the Hospital for Sick Children, Toronto, careful statistics show that an extremely small percentage of syphilitics are detected by the routine Wasserman test that would otherwise be missed. They have, therefore, abandoned the routine use of the test, but employ it freely in all suspected cases. The incidence of syphilis in their wards is very similar to that of the new-born at the General Hospital, namely 1.5 per cent.

It is hoped that other medical centres in Canada may be induced to place their figures on record in some such way as has been attempted here and thus assist in ascertaining the truth about the prevalence of syphilis in this country.

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That modern man is on the threshold of a new era of improved community health, was the promise held forth by Sir Arthur Newsholme, former chief medical officer of England and Wales, who has just returned from a tour of inspection of demonstrations in public health administration in New York State and elsewhere in the United States. This statement was made by Sir Arthur at a dinner tendered him at the Hotel Biltmore by the boards of counsel of the Milbank Memorial fund: "Years are already being added to the life of each member of the community, and every advance in curative and in preventive medicine implies an enhancement in the general standard of life. During the past seventy-five years not less than fifteen years have been added to the average duration of life

in several countries. During the past twenty years the gain in length of life has been greater than in the previous fifty years. Already in the registration area of the United States— notwithstanding the vast number of avoidable deaths in childhood and in adult life, caused by diseases well within our control—the average expectation of life for every infant at birth is fifty-eight to fifty-nine years. A large part of this improvement is directly due to the increased care of health now becoming more general, both by personal effort and by the work of health authorities and of voluntary agencies."— Extract from Sir Arthur Newsholme's address at banquet tendered to him before sailing on his return to London.

SYNERGISTIC ANALGESIA IN LABOUR*

BY WILLIAM J. STEVENS

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SINCE the first recorded use of modern anaesthesia, that of ether in 1847, efforts have been made to relieve the agonizing suffering accompanying labour. Various anaesthetics have been used, and are still used, with varying results. The great question, of course, is to secure an anaesthetic, safe for both mother and child, which will relieve pain, and at the same time will not inhibit the uterine contractions. Relief from pain during labour is one of the greatest assets to the well-being of the average mother. Any form of painless childbirth must be commended—provided it will instill within the mother cheerful prenatal influences, by removing from her the fear of her ordeal; that it will carry her through her labour in comfort and security; and that it is absolutely safe and harmless, both to her and to her child.

Twilight sleep or scopolamine-morphin, or scopolamine-pantapone semi-narcosis has been, and is at present a success when properly employed, but thorough familiarity with the standardized technique, and strict adherence to it, is essential to secure good and safe results. It is best given in a hospital with a special nurse in attendance. The method has been unsuccessful and has been condemned by many because of prejudice, or of the effect morphin is supposed to have on the child. Morphin does affect the child, if used in large doses immediately before delivery, but it has no effect if given under the proper technique in scopolamine-morphin anaesthesia.

Ether with oxygen during the second stage is one of the safest of obstetrical anaesthetics; given at the height of the pain, and quickly removed as soon as the pain subsides. It stimulates and does not retard labour. During parturition and for a perineal repair, when properly administered, it is one of the safest of obstetrical anaesthetics.

Chloroform while it puts the patient under more rapidly than ether, can be a dangerous obstetrical anaesthetic, unless used cautiously. Constant attention of the anaesthetist is required during its administration. Sometimes a little inattention is sufficient to overbalance the patient unfavourably. In all toxæmias, and in cardiac lesions, chloroform is contra-indicated, owing to its aggravation of any heart weakness already present, and producing, as it does, areas of necrosis when acting as a toxic agent.

Chloral hydrate has been proved to be a dangerous depressant, and is less effective than some others.

Ethylene as an anaesthetic is objected to on account of its being highly explosive. It has an unpleasant odor and is apt to increase hæmorrhage.

Nitrous oxide gas and oxygen, during the second stage, is comparatively safe. It is easily inhaled; the patient recovers promptly; the uterine contractions are not lessened; and it does not seriously affect the fœtus. The pain of labour can be greatly decreased by its administration, which should be begun as soon as a beginning contraction is felt by the hand on the abdomen, and *not* too long after the beginning of the contraction. However, in some cases, it produces a condition of excitement, which is undesirable, and it cannot be trusted. The use of gas is time consuming, and we should be unwilling to keep a patient under its influence continually for five to six hours, or to depend entirely upon it in all cases of parturition. The apparatus is cumbersome, the gas expensive, and altogether unpractical as a general obstetrical anaesthetic. However, in the matter of diagnosis, nitrous oxide and oxygen may be exceedingly valuable, for the examination of nervous patients, for minor manipulations, for the introduction or removal of gauze packing, or in inducing labour, where a brief and not complete anaesthesia is necessary, nitrous oxide and oxygen may be of great value.

Synergistic analgesia.— In 1924, Gwathmey,

* Address read before Ottawa Medico-Chirurgical Society, December 18, 1925.

This paper was received early in January, but was lost, unfortunately, between editorial office and office of publication.

of New York, perfected a synergistic method for inducing obstetrical analgesia, based in a great part upon the synergistic action of magnesium sulphate and ether.

The *technique* involves *three* or more *hypodermic injections* and *one* or more *rectal instillations*. The first hypodermic injection is only given when the os is dilated two fingers or more, the uterine contractions are stronger and the pains four or five minutes apart. The first hypodermic injection consists of morphin sulphate gr. 1/6 given with 2 c.c. of 50 per cent magnesium sulphate solution. The morphin is used to relieve the pains, to assist in the cervical relaxation, and to render the anæsthetic easier, smoother, and safer. The salts of magnesium sulphate are capable of producing actual anæsthesia by inhibiting the entire nervous system. Sensation as well as consciousness is temporarily abolished and there may be paralysis of the motor nerve endings. However, with the small dose of magnesium sulphate, i.e., 2 c.c. of a 50 per cent solution, the central effect on the sensation of pain and consciousness can be attained without any preceding excitation, while respirations remain intact. When the magnesium sulphate in a 50 per cent chemically pure solution is used with the morphin the value of the morphin is increased 50 to 100 per cent. The magnesium sulphate as a synergistic intensifies and prolongs the action of the morphin and serves to promote relaxation. The *rectal instillation* contains quinine hydrobromide gr. xx, three fluid drachms of alcohol, two and a half ounces of pure ether, and liquid petrolatum or olive oil up to four ounces.

Method of procedure.—At the beginning of the treatment, it is advisable to explain to the patient that the object of the hypodermic injection and the instillation is to relieve pain; and to insist on the importance of her keeping quiet. If she talks, permit no responses. Place cotton in her ears, darken the room, place a towel over her eyes, and give only necessary attention, talk in a quiet voice, and make all manipulations as gently as possible. The patient is first to be given a routine soapsuds enema and the bladder is to be emptied if necessary. When, on examination, the cervix is dilated to two fingers or more, the pains strong, every four to five minutes, a deep intra-muscular deltoid injection of morphin

1/6 with 2 c.c. of 50 per cent magnesium sulphate solution is given. The morphin is not to be repeated.

If in twenty minutes no relief is afforded the patient, or later, as the effect is beginning to wear off, a second hypodermic injection of 2 c.c. magnesium sulphate solution alone is given, followed by the instillation. Before giving the instillation, again reassure the patient. Place her on her left side—Sim's position, with buttocks to the edge of bed. Insert the gloved index finger well vaselined into rectum, and follow along this finger the stiff French catheter No. 22, with tubing about two feet long with glass connection and a five ounce funnel containing about one ounce of warm liquid petrolatum, having excluded the air. Make certain that the tubing does not curl up in the rectum, but is inserted above the head. This is very important, as otherwise the anæsthetic is expelled, and the results are greatly lessened. The catheter should be directed inwards for about eight to ten inches. The funnel is at first lowered, then raised, and the rectal instillation poured in, care being taken to exclude air. At the end of the instillation, pour in about one ounce of liquid petrolatum to assure full dosage. If a proper insertion of tube is attained, a few minutes only is required to give the instillation. When contractions ensue, during the instillation, with a towel, put pressure on the perineum and encourage the patient. Between pains have the patient "tighten up" on the inserted tube and so induce reverse peristalsis. Tell her that if contents are retained there will be no pain.

After the instillation, have the patient lie quietly on her back, with legs together, and make every effort to retain the contents. Almost immediately or inside of a few minutes the patient will become drowsy. She may talk, but when not answered will fall into a slumber. Pain is eliminated; labour is not delayed. The contractions may be observed by her twitchings, tightening up her fingers or drawing up a leg. Memory of events is either clouded or completely obliterated, and the condition of the baby is not affected by the medication. One or two more additional hypodermic injections of 2 c.c. magnesium sulphate solution may be given to maintain or deepen the effect. If

insufficient, the *instillation* may be repeated after four hours.

Ether or chloroform may be given as usual, during parturition, if necessary. A close watch should be kept on the foetal heart throughout.

Conclusion

A definite *sedative effect on the labour pains* is secured by these measures without increasing the foetal or maternal morbidity or mortality.

The *total length of labour* is not unduly prolonged; in some cases it is shortened.

Post partum bleeding is not excessive. The uterus has at all times a good tone.

To procure ideal results one should be in a position to drop other work, and to spend maybe hours with the one case. In some cases *complete amnesia and analgesia* is attained. The patient after recovery remembers nothing after the first instillation; in other cases the results are not so successful. The results may vary, according to the individual patient; this treatment, however, *possesses great possibilities* for obtaining a simple, inexpensive, and apparently harmless obstetrical analgesia.

In thirty-six of my cases delivered, the results have been most encouraging. Eighteen were multiparæ, eighteen primiparæ; the ages varied from eighteen to thirty-eight; all except one were at term; all began labour spontaneously; two babies required slight external

stimulation for cyanosis; the time from the beginning of the treatment to the delivery varied from forty-five minutes to eight and one-half hours; four cases had vomiting after instillation.

Of the thirty-six cases, thirteen or 36 per cent had extremely easy labours, experiencing practically no pain after instillation. Parturition in most cases was very satisfactorily controlled by ether inhalation; amnesia was complete. In twenty cases or 56 per cent the pains were very considerably lessened. The effect depended to a great extent upon the stage of labour at which the medication was given, the physiological progress of the individual case, and the nervous temperament of the patient. In some of the earlier cases, the instillation was not repeated, when it could have been; and I now use the magnesium solution a good deal oftener to deepen the effect. In three cases, or 8 per cent practically, the whole instillation was expelled, so no benefit was received. At times it is impossible to get the catheter above the head. In all, 92 per cent received quite considerable relief. The effect was judged by the word of the patient after recovery from the delivery, and the external manifestations.

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At a recent meeting of the British Ophthalmological Society Professor H. E. Roaf gave an address entitled "Some observations on colour vision." In an attempt to investigate the way in which radiant energy was transformed into nerve impulses, he set himself to endeavour to understand in what way colour vision was related to the wave-length of light. It was necessary to search for some kind of differential apparatus in the retina, and he set a colour-blind person to copy a coloured diagram by using an ordinary box of paints. By looking through a blue glass one could not distinguish the difference oneself, hence the view obtained was that of a colour-blind person. He examined twenty-eight cases, and found

that in all of them the defect was in the red end of the spectrum. Pigments reflected mixed light, and by cutting out the red end of the spectrum most of the mistakes disappeared. In the cones of birds, reptiles, and amphibians there were coloured globules, situated at the junction of the cone and the cone body. Birds had cones which would perceive red light only, and cones which perceived red and green, and Prof. Roaf proceeded to elaborate his idea that colour-blindness was due to a deficiency of pigment in minute globules. He thought there might also be a good deal to be said for varying degrees of sensitivity of the eye to different colours.—*Brit. Med. Jour.*, May 22, 1926.

Case Reports

BIFURCATE RIBS—AN UNUSUAL CAUSE OF DEFORMITY OF THE CHEST*

By MAX. W. BLOOMBERG, M.D.

Montreal

Although Meyer¹ stated that bifurcate ribs are fairly common Hrdlicka² found only six instances among fourteen thousand anatomical specimens. The only record found in the literature of the recognition of this condition during life is that of Dennis³ who discovered two such cases during routine fluoroscopic examination of the chests of a large number of recruits. For this reason it seemed worth while to report the details of another instance this anomaly which came to our attention.

Case report.—L. D., a boy aged four years, complained of a "lump on the chest" which was first noticed two weeks previously. The personal and family history were unimportant.

The general examination revealed nothing abnormal except for a round prominence of the chest, about two and one-half inches in diameter at the level of the third rib, just to the right of the sternum. It was firm and hard, and not tender.

This prominence gave to the chest a slight "pigeon breast" appearance, and this was classified as one of the chest "deformities". As a matter of routine a roentgenograph was taken which revealed the peculiar condition of bifurcation of the ribs on the right side, the third and fourth ribs being the ones involved.

Comment.—Anomalies are usually found in the first and second ribs, the supernumerary cervical rib being the most common. Occasionally the third rib is the one affected. Rarely are any of the ribs below this found to present any malformation. Strangely enough the right side is more often affected than the left. In Hrdlicka's series of fourteen thousand ribs other than the first and second, four of the six bicaudal ribs were on the right, and only one on the left; the other evidently being the subject of doubt. Two, possibly three, were the third rib and two were the fourth. Several other ribs were found

showing a marked broadening of the sternal extremity but no division in it.

The case cited above conforms to type in that the right side is the one involved, and the third rib is affected. It is unusual in that the fourth rib as well is forked, this apparently being the only instance reported of multiple bifurcate ribs.

The bifurcation always occurs at the sternal extremity of the rib, and the two prongs assume no regularity in their formation. They may run parallel or not; and although the upper is usually the longer of the two this does not always occur.

As may be seen in Fig. 1, there is a distinct broadening of the second rib without any apparent division. The forking of the third and fourth ribs is clearly seen. In the former the two prongs run quite parallel while in the latter they diverge very sharply producing a marked "Y" effect. Posteriorly the three ribs show marked broadening.

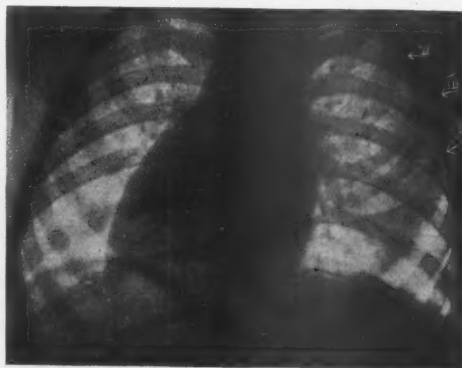


FIG. 1.

One must be careful to differentiate this condition from fusion of two ribs, which may give the appearance of a bifurcate rib, resembling the division of the third rib in this instance. Careful enumeration of the ribs however should preclude this error.

The crowding in the present instance occasioned by these extra costal branches has caused a bulging of the chest wall producing a mild "pigeon breast."

It is frequently assumed that these chest de-

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formities are rachitic in origin, but the writer has maintained that this does not by any means always hold true. The above case is one instance of this. Hess⁴ has drawn attention to a condition of abnormal softness of the chest wall in children who have shown absolutely no signs of rickets. This usually is apparent in weak children with poor flabby musculature. When obstruction of the respiratory tract occurs in such infants, as may be caused by an enlarged adenoid or thymus, the forcible action of the respiratory muscles may produce a retraction of the central part of the sternum, known as "funnel breast" or laterally may give rise to a Harrison's sulcus indistinguishable from that due to rickets. It is not suggested that rickets does not produce deformities of the chest. It does not seem right however to classify all thoracic malformations as rachitic, without other corroborative evidence of the existence of that disorder, such as the presence of craniotabes (in infants over four months), enlarged epiphyses or the typical chemical or roentgenologic findings.

Summary

Bifurcation of the ribs is an unusual malformation and rarely discovered during life. In the present instance there were two forked ribs producing a slight degree of pigeon breast, a deformity which is too often classified as solely due to rickets.

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SAPHENOUS VARIX SIMULATING A FEMORAL HERNIA*

By G. GAVIN MILLER, M.D.

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A sacculated varix of the saphenous vein near its termination is a comparatively rare condition and may closely simulate a femoral hernia. The present case is reported because the differential

diagnosis presents sufficient difficulty to have merited brief mention in the literature. As early as 1774, Petit¹ encountered this condition and emphasized the necessity of obtaining a complete history and making a careful physical examination, if one is to arrive at a correct diagnosis. A review of the somewhat scanty literature dealing with this subject shows that the patient invariably complains of a "rupture", but a careful examination will always reveal the true nature of the condition. Though there are numerous causes of swelling in the femoral triangle, few are apt to be mistaken for femoral hernia.

A sacculated varix of the terminal portion of the saphenous vein presents a soft rounded swelling below, and lateral to the pubic spine. The swelling becomes enlarged after prolonged standing, or following active exercise. It disappears after resting in the recumbent position. The swelling is readily reducible by digital pressure, and gives an impulse on coughing. Pain, if present, is of a dragging, aching character. In the case recorded here, the patient first noticed the swelling immediately after she had completed a course of weight reducing exercises. Such a history, and such clinical findings on examination very closely resemble those encountered in cases of femoral hernia.

To prevent a mistaken diagnosis a consideration of the essential anatomical differences between the two conditions is necessary. A hernia consists of a sac and its contents. Either the neck of the sac, or the omental content can generally be palpated. A loop of intestine is resonant on percussion and is reduced with a gurgling sound. A saphenous varix contains blood which is part of a column of blood extending down to the veins of the leg. In 1852 Cruveilhier² observed, in the case of a patient with saphenous varix, that when the patient coughed, a sensation of tremor was imparted to the swelling, as if a "jet of water" was entering and filling the pouch, and that this was readily appreciable to the palpating finger. Forgeron³ observed that when digital pressure over the varix was suddenly released, a bumping sensation was imparted to the palpating finger. He further observed that a sharp tap on the saphenous varix transmitted an impulse which was seen in the dilated saphenous vein in the neighbourhood of the knee. This observation had been previously recorded by Verneuil.⁴ It is evident

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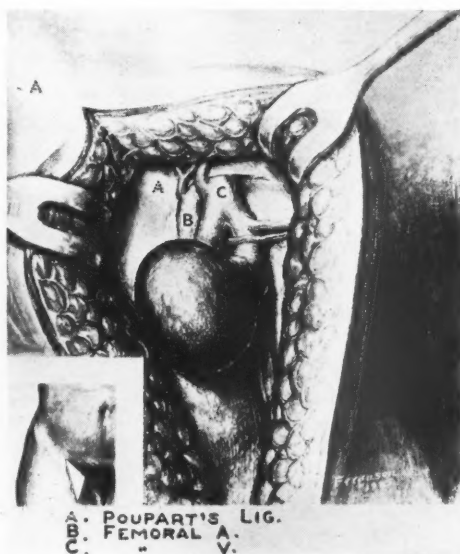
that this test is only of value when the veins of the leg are moderately dilated, or clearly visible under the skin, and the patient is examined in the upright position. Occasionally coughing produces an audible bruit, best heard with the stethoscope over the varix. The patient should be also standing during this observation. The varix fills from below. Thus, if the swelling is reduced by digital pressure, and the finger slowly moved upwards over the femoral ring, it will be found that the swelling tends to recur from below. As long as the finger is held over the femoral ring, the swelling cannot recur if caused by a femoral hernia.

Occasionally the sacculated saphenous varix is not accompanied by varices in the leg, and when the sac contains a more or less organized clot may be irreducible. Dupuytren⁵ reported such a condition, and emphasized the importance in these cases of the history, believing recurrent attacks of severe pain to be diagnostic of an irreducible femoral hernia containing omentum. Erdman⁶, however, reports three cases of sacculated saphenous varix simulating femoral hernia, in two of which pain was a symptom. In the case reported here pain was present and was accompanied by nausea on one occasion. Undoubtedly an irreducible femoral hernia containing omentum is very similar to a sacculated saphenous varix near the femoral ring, containing a partially organized clot, but the latter is firmer and more suggestive of a lymphatic gland. The history of irreducible femoral hernia containing omentum is usually one of several attacks with severe pain, owing to circulatory and inflammatory changes.

Case.—H. F. H. No. 38,267. Mrs. F. D. W., admitted February 9, 1925.

The patient entered the hospital complaining of "rupture". In 1915 she had undergone an operation of appendectomy and uterine suspension, complicated by a secondary infection, probably causing a phlebitis. Two months later the veins of the right leg became noticeably enlarged. This was not progressive and did not cause any symptoms. The present illness commenced three weeks before admission when the patient noticed a swelling in the right femoral region. This was first observed after strenuous exercise. The swelling was larger with the patient erect and after exercise, but disappeared when she was recumbent. On two occasions the

lump was painful and just previous to admission the pain was accompanied by nausea. The general examination was essentially negative; the local condition being the only finding of importance. A soft round swelling, about 2½ centimetres in diameter, was present in the femoral triangle, lateral to, and just below the pubic spine. The swelling was readily reducible and gave an impulse on coughing. A femoral hernia appeared to be the most probable cause, but the moderately dilated veins in the leg suggested the possibility of the swelling being due to a saphenous varix, a supposition which was further supported by the absence of a palpable sac, or hernial contents. The swelling was dull on percussion; sudden release of digital pressure gave a palpable thrill, and a sharp tap on the lump produced an impulse which could be seen passing downwards in the dilated vein below. Finally, after obliteration, the swelling recurred from below, though the finger remained covering the femoral ring. A diagnosis of saphenous varix was made, and, after demonstrating the patency of the femoral vein, operation was advised.



Under general anaesthesia, a three-inch linear incision was made, commencing over the inguinal ligament, lateral to the swelling and following the course of the swelling. The saphenous vein was dissected out, and the varix was exposed. The illustration shows the picture presented. The large, saccular dilatation of the saphenous

vein occupied a position near its termination, and close to the femoral ring. Ligatures were applied above and below the dilatation and the varix was excised. The fascia was closed with fine catgut and the skin edges approximated with fine silk. Following the operation the patient had a slight œdema of the ankle for three days after which convalescence was uninterrupted.

Summary

Sacculated varix of the saphenous vein, near its termination can closely simulate a femoral hernia. Diagnosis depends on the relation of the varix to the venous circulation causing a thrill on coughing, or on sudden release of pressure. A sharp tap on the varix transmits an impulse seen in the dilated vein below. Moreover, a varix fills from below, and, on palpation, no neck nor contents of a hernial sac can be observed.

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A CASE OF THYMOMA

By JAMES MILLER, M.D.

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A young boy, aged nine years, complained one day of feeling a sharp pain in the chest. For some time previously he had been looking pale and feeling languorous. He was taken to his family doctor who noticed the existence of a hard, dry cough. He detected dullness in the upper part of the left side of the chest, no air entering the lung at this point. There were murmurs of an indefinite type over the heart. The mother was advised to keep the child in bed for a few days during which time the pain disappeared. Some days after this the child ran a race in the school sports, and following this the symptoms returned in an exaggerated form. There was pain over the precordium and difficulty in breathing which periodically developed into severe choking fits. These fits were sometimes brought on by taking food. Owing to a

specially severe attack of this kind a laryngologist was summoned who examined thoroughly the upper air passages. At this time the diagnosis lay between laryngeal diphtheria, a foreign body in the air passages, asthma and intrathoracic growth. An examination eliminated the first possibility and for the clearing up of the case an x-ray investigation was advised. It was noted at the time, that the dyspnoea was mainly expiratory. A radiograph of the chest revealed a shadow to the right of the sternum high up, extending outwards about three inches from the mid line. The left border of this shadow could not be distinguished clearly as it blended with a density covering the whole left lung field. A diagnosis of mediastinal growth was made. In a few days the bulging of the left side of the chest in its upper part left no doubt about the true nature of the condition. The breathing became more and more laboured, cyanosis developed and the veins of the trunk enlarged. All this time the child was unable to obtain rest in bed. He was up and about during the day and at night slept fitfully in a chair. Morphine was administered and because of the extreme distress oxygen inhalations were given. The child died twenty-six days after he had first seen his family physician, and three weeks after he had competed in the school sports. It should be added that there was nothing in the previous history of the child to throw light upon the case.

Post mortem report.—The body was that of a young boy well developed and well nourished. There was a distinct bulging of the upper part of the sternum on the left side. A number of enlarged glands could be felt in the lower part of the neck on the same side. The left pleural sac was distended with a large quantity of slightly turbid yellow fluid. The left lung was completely collapsed, and there were small nodules of growth extending from the mediastinum on to the pleural surface between the two lobes. A large tumour mass occupied the greater part of the mid portion of the chest cavity. It extended downwards in front of the heart, which was pushed considerably backwards (Fig. 1). On section the mass was greyish white in appearance and very soft in consistence. A large number of minute ill defined hæmorrhages were present in its substance. Enlarged glands in the neck and mediastinum, and one at the cardiac end of the stomach had a similar appearance. The main mass surrounded the trachea, and large bronchi, but did not apparently narrow the lumen of these channels. The heart showed dilatation of the right side. There was some excess of fluid in the pericardial sac. The mesenteric and retroperitoneal glands were uniformly enlarged and pale. The spleen was large, plum coloured and firm. The liver and kidneys showed no alteration beyond some pallor due to toxic change. The suprarenals appeared normal, and the intestines showed no change. The brain was not examined.



FIG. 1.—Antero-posterior section through mediastinal growth, showing tumour with numerous dark areas due to hemorrhage, and the heart lying behind it.

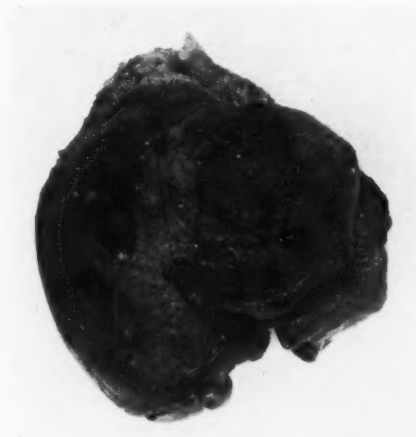


FIG. 2.—Surface view of growth and left lung from the left. The lung is completely collapsed.

Microscopically the growth, both the primary mass and the secondary deposits, showed the characters of a round cell sarcoma. The cells were about the size of a rather large lymphocyte (Fig. 3) and showed a round darkly staining nucleus. There was a thin rim of protoplasm scarcely demonstrable, and there was no intercellular material to be seen except in relation to the vessels. These latter were numerous and thin-walled, the walls consisting of a single layer of endothelium. In addition to the lymphocytes, there were large clear cells with a large amount of protoplasm, and a large pale staining nucleus apparently of endothelial nature. A piece of the tumour taken from its upper and anterior portion showed scattered amongst the growth rounded bodies some of which contained whorl-like centres (Fig.

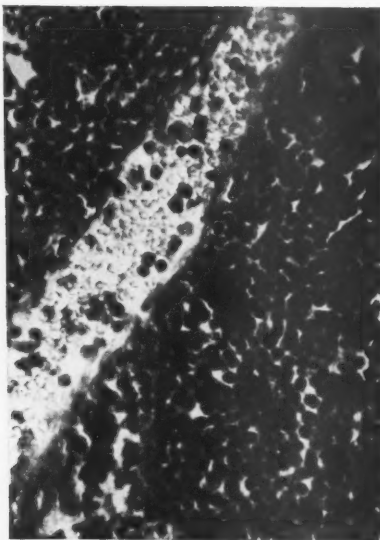


FIG. 3.—High power view of tumour with thin walled vessel running across the field.



FIG. 4.—Low power view of portion from anterior and upper part of growth. The large rounded areas are Hassall's corpuscles. The minute clear areas are the large endothelial-like cells.

4). These bodies had all the appearance of the Hassall's corpuscles of the normal thymus gland. The mesenteric glands were not the seat of secondary deposits, the enlargement being due merely to glandular hyperplasia. The spleen showed nothing of note beyond some congestion. The liver showed toxic change as indicated by granularity of the cells, and the presence of a considerable amount of fat in them. There was also a widespread deposit of yellow homogeneous pigment in the

endothelial cells of the sinusoids. The kidney also showed toxic change. The left lung showed a deposit of growth on the pleural surface, which had commenced to penetrate the lung itself along the septa, and around the vessels.

Summarizing the pathological findings, we have a large tumour originating in the anterior mediastinum apparently from the thymus gland, with secondary deposits in the left pleura, and in the cervical and certain abdominal glands. The tumour surrounded the trachea, and pressed upon the heart and large vessels. There was left-sided hydrothorax with complete collapse of the lung. There was a lymphoid hyperplasia of the mesenteric glands, and toxic changes in the parenchymatous organs.

Discussion of the case from the clinical standpoint.—Although latterly with the bulging of the sternum the nature of the case became plain, in the early stages it presented considerable difficulty. The diagnosis for a time lay between laryngeal diphtheria, heart disease, a foreign body in the air passages, asthma and some intrathoracic growth. The absence of temperature and of any evidence of inflammation in the air passages eliminated the first possibility. The x-ray examination cleared up the case by showing a distinct bulging towards the right side of the sternum high up and a shadow all over the left side. This was eventually proved at the post mortem to be partly due to fluid.

Discussion of the case from the pathological standpoint.—Malignant mediastinal tumours form a well defined group, with well marked clinical symptoms and signs. A majority of them arise from the lymph glands within the thorax; a smaller number from the cell elements of the lung or bronchi, and a few are secondary to growth elsewhere. Another group, not by any means common, take origin from one or other cell constituent of the thymus gland. For this group of tumours the term thymoma has been suggested, and is used by Ewing and other authorities. Ewing states (Neoplastic Diseases, 2nd ed., p. 918), "There is little difficulty in distinguishing thymic tumours at autopsy from tumours of mediastinal lymph nodes, lung or sternum. They usually surround and compress the trachea, bronchi, pericardium and great vessels. Both by compression, and less often by invasion of vessels and air passages, they cause death by asphyxia and venous obstruction, which may increase gradually or supervene suddenly." Two main types of thymic tumours are distinguished by Ewing. (1) Lymphosarcoma probably arising from the reticulum cells but with lymphocytes in varying abundance. (2) Carcinoma arising from the reticulum cells. Foot

(*Amer. Jour. of Path.*, Jan., 1926) thus summarizes the thymomas from the diagnostic point of view:

1. The growth is found in the anterior mediastinum at the site of the thymus.
2. It does not tend to invade bone, extending down the sternum without involving it.
3. The pleura and pericardium are involved by direct extension, rather than by metastasis and the lung may also be directly invaded.
4. There is general resemblance of the type of cells to those of the embryonic or post-embryonic thymus, and the presence of structures resembling Hassall's corpuscles while helpful, is not essential to diagnosis.
5. The sarcomatous tumours occur in young adults, the carcinomatous in patients of "cancer age" in later life.
6. Metastasis below the diaphragm is very rare.

The above descriptions correspond well with the tumour under consideration. It is clear that our tumour falls into the group of lymphosarcoma and into the rare subgroup in which the lymphocyte is the predominant cell element. Other endothelial elements were present but they occupied a very subordinate position. What is the significance of the Hassall bodies? They are clearly not new formations, *i.e.*, a part of the tumour itself. They are rather remnants of the original gland. Might they not then merely indicate invasion of the thymus by a growth arising perhaps from the lymph glands of the mediastinum? The position of the growth in the anterior mediastinum negatives this, and points distinctly to a primary origin from the thymus gland. Foot (*loc. cit.*) points out that there are three cell elements in the thymus gland.—the reticulum cell of endodermal origin, the lymphocyte and the eosinophil cell, both of doubtful parentage. Almost all the tumours so far described arise either from the reticulum cells or from a mixture of these with the lymphocytes. Tumours composed only of small, round, lymphocyte-like cells are very rare. Friedlander and Foot (*Am. Jour. Med. Sci.*, 1925, clxix, 161) have described such a case in which there was also a lymphatic leukaemia. No blood examination was made in our case, but a careful histological examination of the blood in the vessels in various situations revealed no marked increase of white cells, and although

lymphocytes were present in large numbers polymorphs were also found in abundance.

An interesting point in the case was the enlargement of the abdominal glands, some of which showed tumour involvement, but others, notably the mesenteric, did not, the appearances being merely those of lymphoid hyperplasia.

Was the tumour condition implanted upon a previous status thymo-lymphaticus? It is impossible to say. The child was apparently healthy until a few weeks before he died. The thanks of the department are due to Drs. J. F. Sparks and Hendry Connell for their kindness in supplying the history of the case.

Reviews and Retrospects

WHAT IS THE SIGNIFICANCE OF THE SPLEEN?

AN ANATOMICAL AND PHYSIOLOGICAL REVIEW

By I. MACLAREN THOMPSON,

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"Hope deferred maketh the heart sick," saith the writer of Proverbs. Erasistratus could assign no functional significance to the spleen, while to Galen it was *mysterii plenum organon*, and, despite an enormous expenditure of human effort during the intervening centuries, to-day the mystery remains unsolved. But we are saved from undue sickness of heart on that account by two circumstances. One is the progress towards the solution of the mystery which has already been achieved, particularly within recent years; the other is the stimulus to further effort afforded by the extension and intensification in the field of abdominal surgery which these years have witnessed. Thanks to the latter, medical men have acquired a familiarity with abnormal conditions within the abdomen which keeps ever in our minds the insistence with which three, at least, of its organs are clamouring for the elucidation of their biological significance. They are the appendix, the gall bladder and the spleen. Each of these has been deemed "useless", partly by reason of the absence of ill-effects following extirpation; mainly, however, because no function could be definitely established. But these organs exhibit one feature in common which, so far as it goes, would indicate that they are not without function: *congenital absence of any of them is a very rare anomaly.*

Furthermore, whereas the appendix and the gall bladder are normally lacking in certain animals, the spleen, so far as is known, is of constant occurrence throughout the true vertebrates. All three exhibit associations of one sort or another with the alimentary canal. The spleen is an out-and-out lymphoid organ, while the appendix is characterized by its high content of lymphoid tissue.

The spleen is the largest lymphoid organ in the body. It is a member of a series of those organs amongst which certain structural gradations may be traced. Other members of this series are the scattered lymph nodules, the hæmal nodes, the hæmolymp nodes and the lymph nodes (frequently termed lymph glands). *By virtue of its contained lymph nodules (or Malpighian bodies), the spleen assists in the production of lymphocytes.* By virtue of that portion of the so-called reticulo-endothelial system of Aschoff which it contains, the spleen deals with certain particles, organic, such as micro-organisms, or inorganic, such as Indian ink, which may be conveyed to it, and, in all probability, it produces monocytes, or large mononuclear leucocytes. During the evolution of the vertebrates these lymphoid properties of the spleen appear to have undergone but one modification. Upon the evolution of lymph nodes in the terrestrial vertebrates, the lymphoid functions of the spleen were shared with these nodes, so that, while in all probability the spleen never was the sole organ of lymphocyte formation, it is certain that it enjoys even less of a monopoly over that process in the higher vertebrates than in the lower forms. Consequently when the spleen is removed its functions as a lymphoid organ are performed by those lymphoid

phoid structures which remain in the body. An exaggeration of the function of producing lymphocytes is seen in lymphatic leukæmia.

The spleen has been *accredited with a certain immunological significance*, but its precise degree of importance in this connection can scarcely be said to be established. Discussions of this aspect of splenic function are to be found in the writings of Sir Berkeley Moynihan⁹ and of Dr. Krumbhaar⁸.

Red blood cells are found only in one or two rare instances amongst invertebrates. They are characteristic of the true vertebrates (*i.e.*, those which possess a cranium), being absolutely constant throughout this series from the cyclostomes (hag-fish and lamprey) to man. *So is the spleen.* What is the relationship, if any, between the two? In fishes and amphibian larvæ red blood cells are developed in the spleen and kidney, but to a greater extent in the kidney (mesonephros) than in the spleen. In *adult amphibia*, however, the *spleen is the principal organ of blood formation*. An account of the interesting results of splenectomy in these animals is given by Professor Jordan⁷. But after hibernation red cell formation is transferred temporarily to the bone marrow, and *this transfer became permanent with the evolution of the higher vertebrates*. During the embryonic development of the latter, however, the *spleen is an actively hæmopoietic organ*, thus "recapitulating" this phase of its phylogeny.

The spleen is concerned not only with the birth of erythrocytes but also with their death. In the higher vertebrates, indeed, whereas splenic erythrocytopoiesis is confined to the embryonic period, *phagocytosis and destruction of red cells in the spleen proceed throughout post-natal life*. The products of the breaking down of the respiratory pigment within these cells are conveyed through the splenic and portal veins to the liver, where in part they are excreted in the bile; the iron-containing portion, however, is returned to the circulation and utilized in the re-synthesis of hæmoglobin in the erythrocytopoietic tissues. Professor Asher¹ gives an account of the views of his school concerning the significance of the spleen in connection with the metabolism of iron. *This process of red cell destruction is exaggerated in certain pathological conditions*, such as hæmolytic icterus, which is greatly benefited by splenectomy. Even this

function, however, is shared by other erythrocytaphagic (reticulo-endothelial) tissues, such as the bone marrow, which "carry on" after extirpation of the spleen. In hæmolytic jaundice, however, these tissues do *not* take over the *pathological* destruction of red cells after splenectomy, hence the benefit to be derived from the operation; this peculiar condition appears to be a disease of the spleen, not of the erythrocytaphagic tissues in general.

Of interest in connection with the question of the destruction of red blood cells is the problem of *the relationship of the spleen to the fragility of these structures*. Mr. Orahovats—see (4)—has found that red cells obtained from the spleen are on the whole more fragile (towards hypotonic saline) than those from the general circulation; but it has not yet been established whether the spleen actually increases the fragility of the red cells within it, or whether it acts as a species of physiological filter, retaining within itself those erythrocytes which possess a high degree of fragility. This matter is discussed by Professor Barcroft.⁴ In this connection it must be borne in mind that not all the red cells in the spleen are there to be destroyed. *The spleen acts as a reservoir of erythrocytes*, a matter which will be considered presently.

In the lower vertebrates polymorphonuclear leucocytes constitute a much smaller proportion of the white cells than in the higher forms, and the site of their formation varies somewhat in different species. In adult amphibia the spleen is the principal organ of polymorph development, as of red cell development, and with the evolution of the higher vertebrates *the polymorphs accompanied the red cells in the transfer of their place of origin to the bone marrow*. As in the case of red cells, polymorphs are developed in the embryonic spleen of higher forms; and we are familiar with a reversion to this function in spleno-medullary leukæmia.

The clinical fact that splenectomy confers great benefit in thrombocytopenic purpura hæmorrhagica, with restoration of the normal platelet count and coagulation phenomena, suggests an *important relationship* of some sort *between the spleen and the platelets*. The various views upon this relationship are summarized by Doctors Sutherland and Williamson¹⁵.

At this point mention may be made of the fact

that certain of the physiological influences of the spleen have been thought to be exerted through the medium of one or more *hormones*. This aspect of splenic function, which was first indicated by Malpighi in 1686, is set forth by Dr. Eddy⁶. In this connection it must be borne in mind that no definite substance comparable to adrenalin or thyroxin has as yet been isolated from the spleen, and that many of the phenomena which are referred to an endocrine action may be at least equally explicable upon other hypotheses.

In the present state of our knowledge the *relationship of the spleen to the alimentary system would appear to be much more intimate from an anatomical than from a physiological point of view*. In all vertebrates the spleen is associated embryologically and topographically with the abdominal portion of the alimentary canal, although the details of the association exhibit surprising variation in different species. In the lowliest of the true vertebrates, the cyclostomes (hag-fish and lamprey), the spleen is represented by a diffuse collection of lymphoid tissue embedded in the wall of the mid-gut throughout its length⁷. In the South American fish *Protopterus*, one of the dipnoi or lung-fishes, those curious forms which present such a fascinating combination of archaic and progressive features, the spleen is embedded in the wall of the stomach (as, indeed, is the pancreas), a fact established by Professor Newton Parker¹¹. In all other vertebrates the spleen lies altogether outside the confines of the alimentary tube, and is provided with mesenteric moorings. The most puzzling variation, however, is exhibited in the matter of the region of the tube to which it is topographically related. For example in the eel-like amphibian *Siren* it is related to little less than the entire gut; in frogs it is near the beginning of the rectum; while in the majority of animals, including man, it is related to the stomach. Whenever we are tempted to lay stress upon the topographical, vascular and nervous associations between the spleen and the stomach in man, for example, and to infer therefrom a physiological relationship, it behooves us to recall the conditions obtaining in certain lower forms and to realize that we cannot lay claim to a thorough comprehension of the anatomy and physiology of the spleen, say in man, unless we understand likewise the conditions in animals which differ

from him in these respects. Of course the explanation of these differences *may* be very simple. Similarly, we cannot pretend to grasp the significance of the appendix or of the gall bladder without a clear appreciation of the biology of those forms in which such organs are normally absent.

The conditions obtaining in the cyclostomes and dipnoi indicate that the spleen has been evolved out of that complement of lymphoid tissue which characterizes the alimentary canal of the true vertebrates, and which has given rise, in addition to the spleen, to such familiar lymphoid structures as the tonsils, the thymus, Peyer's patches and the lymphoid tissue of the appendix. Naturally the question has arisen whether the entoderm lining the embryonic alimentary canal takes any part in the development of an organ so closely associated with the gut as the spleen. This point has been the subject of careful investigations which have made it fairly clear that the entoderm contributes nothing to the formation of the spleen, this organ being of purely mesodermal origin. So that *in spite of its intimate association with the alimentary canal, in the embryo as well as in the adult, the spleen is not developed from the fundamental morphological element of the gut*, the entodermal lining, standing thus in sharp contrast to its neighbours the liver and the pancreas. This has been found to be the case not only in forms in which the spleen is outside the gut in the adult¹⁴ but likewise in *Protopterus*, in which, as already stated, the spleen is embedded within the wall of the stomach throughout life¹⁵. So that while the spleen is intimately associated embryologically with the alimentary canal, *it is not regarded as a true morphological derivative thereof* in the same sense as the liver, gall bladder, pancreas and appendix.

Various functions connected with digestion have been ascribed to the spleen. It exhibits alterations of size in relation to digestion, and it has been suggested that it may perform a function in connection with the leucocytosis which accompanies that process.⁹ The organ is said to attain a greater size in carnivorous animals than in those which are herbivorous¹². Evidence which may be interpreted as associating the spleen with the secretion and motility of the gastro-intestinal tract, with the secretory activity of the pancreas, with various aspects of

metabolism, and so forth, is discussed in the writings of Sir Berkeley Moynihan⁹ and of Dr. Krumbhaar⁸ already referred to. It may be said that *none of these functions has been generally accepted as being conclusively established.* This is not surprising in view of the morphological considerations indicated above. We must preserve an open mind towards this matter, however, for the day is long past when physiological function was inferred merely from morphological data.

There remains for consideration the relation of the spleen to the circulation regarded as a physical system. Again we look to *Protopterus*, with its primitive spleen embedded in the wall of the stomach. The development of the splenic circulation in this form has been investigated by Mr. Purser¹², who found that at an early embryonic stage the blood spaces which develop in the splenic primordium become connected with the venous drainage from the intestine to the liver; i.e., at this stage the spleen is, as it were, developed in the course of the hepatic portal system, which it divides into two portions, (a) a portion carrying blood from the intestine to the spleen, and constituting in effect a *splenic portal system*, and (b) a portion conveying blood from the spleen to the liver, which might perhaps be referred to as the hepatic portal system proper. It is surely not without significance that at an early stage of development of this primitive type of spleen the circulation of the organ is *entirely venous*. As development proceeds a hepatic portal vein is developed which conveys the venous blood directly from the intestine to the liver, the spleen now lying, as it were, in a collateral loop of the hepatic portal system. Finally the portion of this loop from the intestine to the spleen is replaced by the splenic artery, that portion beyond the spleen persisting as the splenic vein. Applying the "recapitulation theory" to the development of this primitive spleen, Mr. Purser "comes to the conclusion that the original circulation of the spleen must have been entirely venous, being a portal system between the intestine and the liver. Later it was 'shunted' off the main vessel so as to be on a loop alongside. Later still, the delivery of arterial blood removed the necessity of an afferent venous supply, so that in all forms above the Pisces there are present a single splenic artery and a single splenic vein only."

The spleen contains smooth muscle in its capsule and trabeculae, by the action of which it undergoes rhythmical contraction and dilatation. By virtue of these movements it is believed to exert a pumping action, driving the blood through the splenic and portal veins to the liver. But in animals ranging from elasmobranch fishes to mammals a striking disparity between the size of the splenic vein and that of the artery is to be observed. For example in the dogfish *Mustelus* Professor Jefferey Parker¹⁰ describes two large veins connected with the spleen. Mr. Purser¹² points out that this "makes the efferent system extraordinarily large compared with the afferent, both the veins being so much larger than the artery." Again, Professor Tait and Dr. Cashin¹⁶ state that amongst mammals the splenic vein of the dog is nine times as big as the artery, while that of the ox is no less than twenty-five times the size (i.e., the cross-sectional area) of the artery. They point out that "these facts can only mean that the blood of the spleen is at times poured out through the vein in a great torrent, and far more rapidly than it can possibly enter by way of the artery. We may suppose that the spleen slowly fills by steady accumulation of blood from the artery, and that it may under certain conditions suddenly empty itself." so that *the spleen is not only a pump—it acts also as a reservoir of blood.* By what means is the blood caused to accumulate in this reservoir? The answer to this question may be given under three headings. (a) The spleen dilates, apparently under the influence of the depressor fibres of the vagus (in the cat at any rate), as Mr. Masuda discovered—see (4). (b) Regurgitation through the arteries is prevented by the valvular action of the splenic ellipsoids, as was shown by Professor Mall and others—see (16). (c) Professor Tait and Dr. Cashin¹⁶ have found that the splenic vein (in dogs and cats) is capable of an extraordinary degree of contraction—almost to the obliteration of its lumen. Such contraction of the splenic vein is capable of reducing the amount of blood escaping through it, and so of aiding the dilatation of the organ and the accumulation of blood therein. They point out the highly suggestive possibility that pathological contraction of the splenic vein may be a factor in the production of splenomegaly.

This *reservoir function of the spleen* has been

the subject of much work of late in the physiological laboratory at Cambridge, under the direction of Professor Barcroft, who has given us two valuable summaries^{3,4} of this work—see also various papers in recent volumes of the *Journal of Physiology*. Messrs. de Boer and Carroll—see (3)—have found that the blood which accumulates in the splenic reservoir is especially rich in erythrocytes, so that the spleen serves as a storehouse, not merely for blood, but for red cells in particular, and, *ipso facto*, for hæmoglobin. The fragility of the red cells obtained from the spleen has already been mentioned. Under what conditions does this reservoir action come into play? The alterations in the size of the spleen in relation to digestion may perhaps have some significance in connection with those changes in the portal circulation which accompany that process, but this point does not appear to be established. More is known about its relation to the general circulation. Mention has already been made of Mr. Masuda's observation that the spleen dilates under the influence of the vagus. It has been found that this event follows the injection of a large quantity of normal saline, which increases the volume of circulating fluid and thereby throws an extra strain upon the heart. Under such circumstances the latter organ is afforded a measure of relief by this mechanism. On the other hand, the spleen contracts and expels its contents into the general circulation under conditions in which there is a need for more circulating blood, such as hæmorrhage, exercise, carbon monoxide poisoning, and so forth.

It would seem no more than reasonable to suppose that a quantity of blood lying more or less stagnant in the spleen would be to a considerable extent venous in character. In view of this, surely the originally venous nature of the entire splenic circulation, which was discussed above, is not without its significance. Even in the human embryo the splenic artery is late in developing⁵.

Here is a splenic function which, so far as is known, is not shared by any other structure in the body, and one which must therefore be lacking in the absence of the spleen. The results of splenectomy show that even this function is not indispensable, under ordinary circumstances at any rate. In this connection, however, one may refer to an interesting case reported by Dr.

Auden². An unmarried female, aged twenty-four, "previously healthy in every way", died suddenly with symptoms of cerebral hæmorrhage after a light meal one very hot day. "At a post mortem made twenty-eight hours after death, an extensive hæmorrhage into the fourth ventricle was discovered, breaking into both lateral ventricles and into the substance of the brain. No focus of hæmorrhage and no aneurysmal dilatations of the arteries of the brain could be discovered. The valves of the heart were perfectly healthy, as also were the lungs, liver and kidneys, and there was no evidence of infarcts. Beyond a very small accessory spleen, no spleen could be discovered in spite of a careful and detailed search. It appears a reasonable hypothesis that the absence of the spleen, the abnormal heat, and the hæmorrhage at this unusually early age, stand in correlative association." This case is of exceptional interest inasmuch as the attention of Professor Barcroft and his colleagues was first drawn to the reservoir function of the spleen by the puzzling observation, made during the course of a voyage to Peru, that blood volume and circulating hæmoglobin increase with a rise in the external temperature. While the precise pathogenesis of Dr. Auden's case is by no means clear, it loses little of its interest on that account.

Although the reservoir function of the spleen is the subject of some of the most recent researches on splenic function, it is by no means a new conception. To those to whom Gray's *Anatomy* is an old friend (or enemy!) it may be of interest to recall that the original author of that treatise, Mr. Henry Gray, won the Sir Astley Cooper prize in 1853 for an essay "On the Structure and Use of the Spleen", in which he concluded that "The function of the spleen is to regulate the quantity and the quality of the blood. . . . The most satisfactory proof that we can possess is that the spleen really does contain, under certain circumstances, a varying amount of blood, and that that amount is to such an extent as to justify us in concluding that the organ serves to regulate its quantity." But that the idea really goes back into antiquity is indicated by the following interesting footnote on one of the pages of Phineas Fletcher's remarkable poem "The Purple Island, or the Isle of Man" (Canto III, Stanza 19), published at Cambridge in 1633: "Trajan compared the

splene to his exchequer: because as his coffers being full, drained his subjects purses, so the full splene makes the body saplesse."

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RECENT ADVANCES IN HÆMATOLOGY

3.—THE BLOOD PLATELETS*

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Since their discovery in 1877 by Hayem,¹ the thrombocytes or blood platelets have been of both clinical and physiological interest because of their relation to hæmorrhage and the clotting of blood.

1. *Platelets and hæmorrhage*.—In 1740 Werlhoff described a symptom-complex characterized by spontaneous hæmorrhages into the skin, mucous membranes, and viscera, under the name of "morbus maculosis hæmorrhagica". Brohm² (1881) reported a marked diminution in the number of "hæmatoblasts" (Hayem) occurring in two cases of this disease. In the following year Bizzozero³ (1882) advanced the

claim that these cells were not hæmatoblasts, but a third independent element of the blood. He further recognized that they are the basis for every thrombus, and called them platelets. Later Denys⁴ (1893) found that the platelets are diminished in several diseases associated with a hæmorrhagic tendency.

Experimental confirmation of the relation of the thrombocytes to the hæmorrhagic tendency was reported by Duke⁵ (1910). He showed that spontaneous hæmorrhages occur in rabbits when the number of thrombocytes are experimentally reduced below 35,000 per c.mm., and proved that such a reduction is associated with a prolonged bleeding time. In other experiments, although the platelets were not greatly reduced in number, they were altered so as to lose their thrombus-forming ability.

2. *Platelets and coagulation*.—Arrest of hæmorrhage as a rule implies a process of coagulation. This is, however, not universally true. The invertebrates, with the exception of the arthropods, have incoagulable blood and yet, after section of a corresponding vessel, bleeding stops more quickly in the lobster than in the crab, which has coagulable blood. Hæmostasis in the latter animal is brought about by the plugging of the wound by adhesive corpuscles, which are in many respects similar to the platelets of mammals.

Hardy⁶ (1892) found explosive corpuscles in the blood of crustaceæ, and Tait⁷ (1910) showed that fibrin formation begins where each one of these corpuscles bursts. Recently Burke and Tait⁸ (1926) have observed the same process taking place in rabbit's and human blood, under the dark field microscope. When a platelet bursts globules of protoplasm are projected radially in all directions. Along the course of these particles, threads of fibrin are laid down. When the platelets are experimentally removed, the blood remains fluid indefinitely unless tissue extract, or platelets are added.

Two separate processes may, therefore, act to arrest hæmorrhage. There is the actual mechanical plugging of the vascular defect by platelets. When in contact with any foreign matter these cells alter in some way, so that their adhesiveness is greatly increased. Hence the attachment of one platelet to a vascular defect is rapidly followed by the adherence of

* The Origin of the Red Blood Cell in Adult Marrow, *Can. Med. Assoc. Jour.*, Feb., 1926, xvi, 174. Laboratory Aids in the Diagnosis of Anæmia, *Can. Med. Assoc. Jour.*, April, 1926, xvi, 430.

others to it, so that soon an agglutinin of platelets fills the hole. This is entirely distinct from coagulation. The second process is gelation of the blood and involves not only the platelets but the plasma and the erythrocytes. The substance which initiates this process (thromboplastin or thrombokinas or cytozyme) may be derived from either cytolized platelets or tissue juices at the point of rupture, or from both. The end result is the formation of fibrin and clotting.

The retractibility of the clot, according to Lee and Minot (1917), is also dependent upon the platelets. The number of thrombocytes normally present in the blood are believed to be far in excess of the actual need for complete coagulation. The degree of retraction of the clot, however, depends upon the number of platelets which do not undergo cytolysis during the process of coagulation. Thus a blood poor in platelets may clot in the normal time, but during the process all the platelets have been utilized, so that no retraction takes place.

3. *Platelets and the hæmorrhagic diseases.*—The foregoing facts are of some importance in interpreting the findings in hæmophilia, and the diseases associated with purpuric manifestations.

In Werlhoff's idiopathic purpura the number of platelets is greatly diminished. In place of 250,000 to 400,000 per c.mm., counts as low as 5,000 per c.mm. are encountered. When the number is below 35,000 per c.mm., spontaneous hæmorrhage is almost certain to occur. The bleeding time, as would be expected, is prolonged from the normal to one or even two hours. The clotting time is frequently normal, but the clot is not firm, and there is no retraction.

The blood findings in hæmophilia, on the other hand, are practically the opposite. The platelets are normal or even slightly increased in number. The clotting time is much delayed but the clot is firm and retracts normally. The bleeding time is normal. Though not numerically deficient, the platelets are abnormal in activity. The substance which results from their cytolysis, and which initiates clotting, is very slowly formed. The process, though much delayed, is eventually normal in quality and in retractibility. The bleeding time is, as a rule, not prolonged because, by Duke's method, only

a small puncture wound is made. The small stream of blood exuding, according to Lee and Minot,⁹ becomes so mixed with tissue juices as to render it coagulable at once. If the defect is large, as in an incised wound or laceration, the amount of blood escaping is only slightly mixed with tissue extract, and therefore maintains its fluidity. Thus bleeding may continue for hours.

In the symptomatic purpuras, including the Schönlein and Henoch type, scurvy, endotheliosis hæmorrhagica, and in other diseases associated with hæmorrhagic manifestations, the platelets are either normal, or show a reduction corresponding to the degree of anæmia. The bleeding and clotting time are, as a rule, normal.

There have been few, if any attempts to explain why spontaneous bleeding should occur in the hæmorrhagic diseases. In idiopathic purpura, where the platelets reach extraordinarily low levels, bleeding is to be expected. In such cases, however, after splenectomy the thrombocytes not infrequently return to low levels without giving rise to hæmorrhage. In the symptomatic types, purpura is a feature in spite of almost normal blood findings. The underlying basis for the spontaneous bleeding in these diseases may be the result of a pathological alteration of capillary permeability.

4. *Platelets and immunity.*—The platelets are said to play an important part in the process of inborn immunity against pathological microorganisms. This function can best be explained by citing experiments from the published investigation of Prof. Govaerts¹⁰ (1918), which was suggested by the earlier work of Bull¹¹ (1915). If an animal is given a large intravenous injection of bacteria, and cultures are taken from his carotid artery at minute intervals, two entirely different results may be obtained, depending upon the type of bacteria utilized. If it is an organism to which the animal is susceptible the number of organisms per c.cm. of blood remains constant or rises slightly, and a septicæmia develops. If he is not susceptible to the organism, the number of organisms per c.cm. undergoes a rapid drop within seven or eight minutes almost to nil. In the latter instance, microscopical examination of the blood shows the organisms to be adhering to platelets, which stick to each other and to more organisms, till a large clump of bacteria and

platelets is formed. These clumps rapidly disappear from the blood stream. In the case of those bacteria which are pathogenic to the animal, similar examination shows that there is no tendency for the platelets and organisms to adhere to each other. Even after many minutes both are circulating in the blood undiminished.

If an animal is injected with two different types of bacteria, to only one of which he is susceptible, the platelets are found to be attached to the one, while the pathogenic type shows no tendency to clump. When this experiment is repeated in vitro the same discrimination by the platelets is noted. This suggests that the clumping, which the author has further shown to be quite different from simple agglutination, is a physico-chemical process.

Whatever may be the mechanism, it is through the activity of the thrombocytes that the blood stream of the immune animal is freed from microorganisms.

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THE CONTROL OF DIPHTHERIA

A Review

An excellent review of the public health features of diphtheria is given by J. D. Rolleston in an article which appeared in the April issue of the *Journal of State Medicine*. The usual immunity of young infants is shown in the statement that out of 3,000 cases only seven were in patients under six months of age, and only twenty-three in those under one year. In the explanation of the greater relative susceptibility of females, most marked in adult life, it is suggested that the intimate associations of females with sick children is a factor of importance. In-

fection is usually through "droplets"; hence the importance of bearing in mind the frequency of nasal diphtheria—so easily overlooked in children. Diphtheria of the skin often simulates common skin lesions, and may appear as eczematous or bullous eruptions from which the infection may spread. Such lesions are rapidly cured by antitoxin, but if their true nature is not detected they may last for weeks. Of foods and drinks, milk alone is of importance in the dissemination of diphtheria. Defective drains play no part; the bacillus is not found in sewer air. In respect of fomites, the *B. diphtheria* is relatively hardy and contaminated objects kept in the dark may remain infective for some time. Virulent bacilli may be recovered for a considerable period from artificially infected books, but they are rarely found in books which have been handled by diphtheria patients. Cats, while frequently harbouring non-infective diphtheroid organisms, are not susceptible to diphtheria and are unlikely to disseminate it.

Carriers are most successfully dealt with by the removal of the tonsils and the treatment of sinus infections. The persistence of infectivity is due to local infections (tonsils, adenoids, sinuses), and, in the absence of such, positive cultures have little meaning and may be disregarded.

Passive immunization should be limited to children as a rule, and is not required in those who can be kept under close observation. As adults are especially liable to serum sickness, and usually come under treatment promptly, passive immunization in their case is not usually to be advised. In all cases, it may interfere with active immunization by over neutralization. Kraus and others recommend immune cattle serum for passive immunization, because of its relatively slight tendency to cause serum sickness.

In discussing the Schick test, Rolleston refers to the high percentage of positive reactions in persons ill with scarlet fever and measles—corresponding to the susceptibility of such persons to diphtheria. Reference is also made to the frequency with which identical Schick reactions are noted in different members of a family, which the Hirzfelds and Brokman believe to be associated with blood grouping.

Should diphtheria make its appearance in a school or institution, Rolleston advises as fol-

lows: (a) Schick test everyone; (b) swab throats for laboratory examination; (c) isolate negative reactors, as carriers give negative reactions; test positive swabs from such for virulence and release avirulent but continue isolation of virulent carriers; (d) make repeated examinations of positive reactors; (e) immunize positive reactors with antitoxin and later with toxin-antitoxin.

Three weeks should pass after the administration of antitoxin before beginning active immunization. Active immunization may prove insufficient in persons exposed to heavy and repeated doses of virulent bacilli.

The possibility of a dissociation of the toxin and antitoxin in mixture, with a resultant severe and even fatal reactions, must be remembered. Because of several recent fatalities in Austria, active immunization has been prohibited in that

country. The public health and education committees of the London County Council have advised against the routine use of the toxin-antitoxin mixture as part of that Council's health scheme for school children.

In respect of anatoxin, the objections of Aldershoof (Utrecht Serological Institute) are noted: (a) undiluted anatoxin may produce a violent, though harmless, reaction; (b) the reliability of diluted anatoxin is not proven; (c) protein-free anatoxin is not yet available.

In summarizing, Rolleston asserts that as antitoxin will jugulate diphtheria if used within twenty-four hours, the practitioner is not under the same obligation to urge active immunization against diphtheria as to urge vaccination against smallpox. Passive and active immunization each has its drawbacks, but the latter gives the more complete and the more permanent result.

W. H. HATTIE

Cholecystography: Use of Phenoltetraiodophthalein.—Evarts A. Graham, Warren H. Cole, Glover H. Copher and Sherwood Moore, St. Louis, have now given the sodium salt of phenoltetraiodophthalein intravenously to fifty patients. For purposes of intravenous use in cholecystography it seems to possess very decided advantages over anything else hitherto employed. Satisfactory shadows of the gall bladder can be obtained with smaller doses than with the isomeric compound, tetraiodophenolphthalein. Its use, therefore, is followed by fewer and much less severe toxic reactions, although within the last year these have been negligible with the tetraiodophenolphthalein. The toxicity of this whole group of substances seems to be due chiefly to the phenolphthalein part of the molecule, as judged by the fact that toxic effects can be produced by injections of phenolphthalein alone which are apparently identical with those produced by the halogenated phenolphthaleins. As an average intravenous dose, the authors have used the phenoltetraiodophthalein in amounts of 0.04 gm. per kilogram. They have used amounts up to 2.5 gm. for adults. They have not found it necessary to exceed that amount in any case, although it is conceivable that unusually large persons might require larger doses than this. For the sake of convenience, they ordinarily give

it in one dose dissolved in 30 c.c. of freshly distilled water. In this way it may be given easily with a syringe. But if larger dilutions are desired it may be given by the gravity method. In the fifty cases there were three instances of slight dizziness of no more than ten minutes duration. In the other cases there was no reaction of any kind. The fact that it gives satisfactory results in relatively small doses makes it possible also to make the injection all at one time without the same fear of toxic reactions as is the case if the larger dose of tetraiodophenolphthalein is given at one time. Likewise the danger of thrombophlebitis is reduced. There have been no instances of this in this series of fifty cases. A final advantage lies in the fact that this substance seems to be more rapidly excreted through the liver, and accordingly the time necessary for a cholecystographic examination can therefore be shortened. Excellent shadows of the gall bladder may usually be obtained in four hours after the injection of the phenoltetraiodophthalein. Only indifferent success with this substance has resulted when administered orally. Another substance which gives excellent cholecystograms is the sodium salt of tetraiodoisophenolphthalein. Preliminary experiments indicate a marked absence of toxic effects.—*Jour. Am. Med. Ass.*, June 19, 1926.

Editorial

THE PATHOLOGICAL CONFERENCE AND THE CASE METHOD OF TEACHING PATHOLOGY

FROM time to time it is necessary for us to reconsider and revise our methods and manner of teaching. Medical teaching is naturally *sui generis* but its methods must always be similar to those of other arts and sciences. It is to the credit of its practitioners that they are probably as up to date as any, and this in spite of the fact that many of the best teachers in medical schools are not whole time men, and the vast majority have no special training in teaching.

It is easy to over emphasize mechanism in teaching. After all the thing which is taught is the main matter and not the methods by which it is effected. Yet time and again the seed may fall to the ground and die because of a lack of method in its presentation. The same teaching delivered parrot-like by a man who does not fully understand it, will in the mouth of him, who knows vastly more than the mere rudiments, claim the attention, and fix facts in the mind. Even the delivery of carefully thought out word of mouth material, however it may be backed by a well stored mind, is only too apt to fail in its object. For medical teaching at any rate the method of presentation must be as practical as possible. The didactic lecture is retained in the curriculum only in a modified form, and it must ever give place to the practical demonstration.

What, we may ask, are the fundamental factors in good and efficient teaching, which we have learned from the experience bred of repeated failures, discussions on methods, and the pronouncements of the specialists who scan our schools? First and foremost, we have to face the fact, unpalatable as it may be, that the vast majority of medical students have

an ineradicable notion that they have come to study medicine in the six years they have set aside for preparing themselves for their life work. They are apt to subject each department of their curriculum to the touchstone of whether or not it is going to help them in their practice. Now this is no doubt wrong. They ought to love knowledge for knowledge sake. Some of them do, but most of them are impatient under the teaching of those professors of chemistry and physics, who make no attempt to point out the practical bearing of the facts. Naturally, a great deal of elementary fundamental knowledge must be acquired in physics and chemistry before the more definitely medical aspects of the subject are dealt with, but as soon as possible a practical flavour should be inserted into the teaching.

Then, there is the question of whether or no the teaching in our particular subject should be packed into one year, or part of one year, or on the other hand distributed through the curriculum. Undoubtedly experience is in favour of the latter method. A student should be studying anatomy, physiology, pathology and bacteriology and in a sense physics, chemistry and psychology right up to his final year.

But how is this to be effected; when and where are we going to correlate our scientific and our clinical facts, and how in the already crowded state of the curriculum are we to find time to teach physics, in relation to ophthalmology and radiology; embryology in relation to midwifery, and surgical malformations; chemistry in relation to clinical tests, and physiology in connection with all deviations from the normal?

William Osler was probably the first

to make use of the conference as a method of teaching. He initiated it while he was at McGill about the year 1876. His notion was that a case should be worked out fully and considered from all its aspects, physiological, pathological, medical or surgical as well as from the therapeutic. Naturally, the case which came to autopsy formed the basis of those Saturday morning meetings, which were so popular amongst the McGill men of the day. Osler was singularly well equipped for running such a conference. He had a sound biological background. He was a teacher of physiology, who voluntarily conducted the autopsies at the General Hospital, and who at the same time was on the clinical staff. Probably no man could be so well equipped in these days, when medical knowledge is so much more departmental. Now-a-days, the conference must be run with the assistance of the professors in the various subjects. Sometimes a case has a physiological bearing, sometimes a chemical, at other times a bacteriological and always a therapeutic aspect. Thus we must invite the professors in these various subjects to our modern conferences as well as our clinicians. And they will come. They only require to be asked once to make them realize the interest for themselves, as well as for their students. Here we have the great correlating centre for all the various branches of medical study during the two final years of the curriculum.

The conference starts with the medical history of the case, the salient facts being brought into strong relief by the clinician in charge, or by the interne, or possibly even by a student clerk. The pathological findings are then put forward, the autopsy report read, the gross specimens displayed and handled, and microscopic sections shown by means of the projection lantern or microscope. Then comes the discussion. The case is, let us say, one of exophthalmic goitre and the professor of physiology or of medicine leads off on the function of the thyroid, the pharmacological action of its secretion, its relation to basal metabolism, cardiovascular system, etc. Then comes the surgeon on

the question of operative interference with its varied possibilities. Perhaps a lively discussion arises amongst colleagues as to the best methods of procedure. Such an occurrence will fix all the better the facts in the student's mind, and give him the broader outlook, which is all too infrequent amongst pupils of a given school. But what about the impression upon the student's mind? Does it last? That of course is the great question. On a famous occasion Osler answering the query of what should be the guiding star for the teacher of medicine said:—"repetition, repetition and again repetition." Or to put the point physiologically, it is the "summation of stimuli." The pupil hears and forgets and hears and partially forgets but a time will come when he will hear and remember. But there is another and perhaps a better way. A student will never forget anything which he himself produces. The product of his own brains becomes a part of himself. A conference conducted on the lines just indicated is largely time thrown away, unless the student puts pen to paper and reviews the case himself.

Most schools insist upon the student submitting a certain number of post mortem reports. The good done to him by transcribing these reports is largely lost on account of the absence of a clinical history,—in other words for want of correlation of clinical and pathological facts. Some twenty-five or thirty years ago, while he was professor of pathology in Manchester University, Lorrain Smith, now of Edinburgh, initiated a system of teaching pathology by means of cases. According to this method the student is required to study thoroughly six cases during the year in which he is taking his pathology. He submits a report on these cases under the following headings: (1) the clinical history which is supplied to him. (2) A description of gross appearances in organs at the post mortem. The student ought of course to be present at the autopsy but in any case he must make his own description of the various organs and tissues. (3) A full description of the microscopic appearance in the organs accompanied by drawings. (4)

A discussion of the main theme:—pulmonary tuberculosis, pernicious anaemia or whatever it may be. In this part of the case he is encouraged to consult current literature on the matter. In fact, the student is stimulated to make of his cases an introduction to research of a simple type. (5) Lastly, a correlation of the pathological and clinical facts with a statement as to the cause or causes of death.

Since coming to Queen's University the author has adopted a similar system in connection with the cases which come up for consideration at the conferences which are held weekly in the hospital. The student is asked to hand in ten such cases during the last two years of the curriculum, five in the fifth year and five in the final year. A certain amount of option is permitted in the selection of the cases. But the better ones from the teaching point of view are indicated to him. The guide for the student is that he should select one case of tuberculosis, one of general infection, one of pneumonia, one of arteriosclerosis, a blood case, a heart case, a kidney case, a liver case, at least one tumour case and an endocrine case.

These cases when completed are handed in to the teachers and are corrected, annotated and returned to the student. This of course means time and trouble for the teacher, but it is trouble well expended. Marks are given and these marks are taken into consideration in the results of the final year. There never has been an instance in which a student received marks under fifty per cent for a case, because the pleasing feature of the method is the interest which it excites. The real difficulty is to prevent the men from writing a small text book on the subjects.

For some months there have been appearing in the *Journal* cases of this kind which have come up for discussion at our conferences. They have been considerably curtailed as regards discussion of the main theme, but they indicate the method in outline.

The reward for the teacher of pathology for the trouble which he has to give, is that the student appreciates the value of morbid anatomy. He becomes interested in it, and from being the driest subject of the later years of medicine it becomes living and real with a definite meaning for his future life work.

JAMES MILLER

TOBACCO FROM A MEDICAL POINT OF VIEW

HOW may we best answer questions as to whether smoking is good or evil? It is only the fanatic who would immediately condemn all smoking; and we have seen enough of the results of fanatical decrees in prohibiting the use of alcohol. On the other hand, if moderation is to be our counsel, it can do no harm to say something about the dangers of excess; the average man may be able to regulate his consumption of tobacco perfectly well, and yet be interested in some of the technical facts regarding it.

It is not easy to find authoritative writing on the medical aspects of the use of tobacco: our textbooks simply do not deal with it. So that Sir Humphry Rolleston's recent address* on the subject is as timely as it is

fascinating. What strikes one as a most important fact regarding the smoking of tobacco is that it actually does produce substances which even the most inveterate smoker would admit to be both poisonous and irritating. Nicotine, furfural, carbon monoxide, ammonia, and pyridine derivatives all occur in tobacco smoke, and in amounts not always infinitesimal. The blood of cigarette smokers, may show carbon monoxide absorption even up to five per cent (Dixon); Cavendish tobacco contains 4.15 per cent of nicotine, and in the pipe as much as eighty per cent of the nicotine may pass into the smoke. Then, too the effects on the blood pressure are definite, beginning with a rise of from 5 to 20 mm. Hg. (systolic), and later giving rise to a fall below normal. Sir Lauder Brunton held that a systolic

* The *Lancet*, May 22, 1926.

blood pressure of 100 mm. Hg. in a strong, healthy man without any evidence of tuberculosis, indicated excessive smoking in nineteen out of twenty cases. There is evidence also, that tobacco-smoking produces a sufficiently severe spasm of healthy blood vessels to cause definite symptoms, and Parkes-Weber thinks that excessive cigarette smoking is a causal factor in thrombo-angiitis obliterans among young non-syphilitic Jews in the East End of London. Experimentally, it is certain that nicotine causes arterial degeneration in rabbits.

It is a little severe to speak of smoking as an addiction, even when it is done to excess. Sir Humphry quotes one case, however, in which the habit was, to say the least, ineradicable. This man said that he smoked 100 cigarettes per day. He had stopped for a time, but eventually returned to his smoking, because the abstinence interfered with his work: not that he was restless, as might have been supposed, but because he found his writing was continually interrupted by the automatic fumbling of his left hand for the absent cigarette box! Smoking may produce a craving when an attempt is made to give it up, but this can seldom be described as overpowering. Restlessness also may result, but this cannot be compared with the physical distress caused by the withdrawal of morphine in a case of morphine addiction.

Idiosyncrasy to tobacco is frequently met with, and is as inexplicable as it is in any other cases. Some can tolerate tobacco only in cigarette form and even confirmed smokers may be completely upset for no apparent reason. The late Sir Clifford Allbutt wrote as follows (it is believed that he was referring to himself):—

“One case is known to us of a man whose general health is excellent, who is by no means a neurotic subject, and whose heart stands work well in all other respects, in whom intermittence of the heart may occur for many days if he remain for an hour or two in a room with many smokers. He never suffers from any cardiac disorder unless exposed to tobacco, but this susceptibility to its effects has hung about him for many years. He has no dislike

to the drug, nor does he feel any immediate discomfort from it.”

At the same time, it is to be noted that the effect of tobacco smoke may be altered to some extent by the rate of smoking; thus, Virginia cigarette tobacco contains 1.4 per cent of nicotine, nearly twice as much as Manila cigar tobacco, and yet the cigar smoke contains more than double the amount of nicotine found in cigarette smoke (Dixon). And, again, Virginian cigarette tobacco, if burnt in a pipe, gives off smoke containing from thirty-seven to fifty-three per cent of its nicotine content, compared with smoke of a content of only 0.06 per cent when it is burnt as a cigarette. The degree of combustion is an important factor, and it is most complete in cigarettes of all kinds, least in a pipe, and midway in the case of cigars. A long pipe is better because it allows the nicotine to condense in the stem to such an extent that very little passes into the smoke.

Something must be allowed for the psychological element in the effects of tobacco smoking. Some men can only smoke when they have companionship, and the well-known soothing effect of cigarettes on the wounded can hardly be attributed to the amount of nicotine absorbed. Smoking does seem to have a certain effect on the higher intellectual centres. After a transient preliminary stimulating effect on mental processes, its sedative effect develops. A series of psychological tests on medical students has shown that smoking lowers mental efficiency in from ten to twenty-three per cent of the smokers, and especially in the faculties of imagination, perception and association. The habit is believed by some observers to impair the memory for names, and render sleep less refreshing, and it may be in heavy smokers a predisposing cause to premature senility.

And yet, in spite of all this, history shows that it matters little whether smoking is condemned or not, for it has survived more than one determined attempt at its prohibition. The “tobacco question” will only cease to be a problem when the millenium of common sense arrives. In the meantime, there will be enough difference of opinion to give rise to such quaint reflections

as those of Calverley, in his famous "Ode to Tobacco." To him, it is

Sweet when the morn is grey;
Sweet when they've cleared away
Lunch; and at close of day
Possibly sweetest:

I have a liking old
For thee, though manifold
Stories, I know, are told,

Not to thy credit;
How one (or two at most)
Drops make a cat a ghost—

Still, why deny its use
Thoughtfully taken?
We're not as tabbies are:
Smith, take a fresh cigar!
Jones, the tobacco-jar!
Here's to thee, Bacon!

H. E. MACDERMOT

NEW FACTS CONCERNING DIGITALIS

THERAPEUTICALLY regarded, knowledge concerning digitalis may be said to be in a fairly satisfactory state; pharmacologically considered, the gaps in our information are only too evident; but when viewed chemically, our knowledge of digitalis appears at its worst. It is rather surprising that digitalis therapy and pharmacology have advanced as far as they have considering the complexity of the preparations used. What information is extant has been wrung from nature with great effort; there is still much to learn and much confusion to dispose of. The effort which has been devoted to the study of digitalis may be judged from the fact that in his monograph on "Digitalis and its Allies" Cushny cites no fewer than 559 articles. If he had included all the clinical articles as well, what would the number have been?

The partial confusion and slow growth in our knowledge of the actions of digitalis are due in part to the limitations of our information concerning its chemistry. With a long medical history behind it, it is natural that in the case of so valuable a remedial agent, physicians and laboratory workers should have insisted upon using and studying digitalis, without waiting upon the chemist to disclose its active constituents; but one must question whether progress would not have been more rapid, if the chemist had entered the field earlier. By himself the chemist is not likely to do much directly for therapy, but where the dependence of medical progress on chemical knowledge is so apparent, as in the case of digitalis, it is

unfortunate that the chemists' assistance has not been called in sooner. In substantiation of the first phrase of the foregoing sentence, one need but mention that the local anæsthetic action of cocaine was known to the chemist as a property of the alkaloid long before the importance of this action was realized by therapists.

The chemistry of digitalis is particularly difficult. Its active constituents are not present in large amounts and, unlike alkaloids, they are much more difficult to isolate. They belong to that group of compounds known to chemists as glucosides; compounds resulting from the union of a carbohydrate (often glucose) with some other organic compound (usually containing no nitrogen). While it would be far from the truth to say that nothing is known concerning digitalis chemistry, it is true that there is still a great amount to be learned. Recently what looks like a long step forward in this direction has been taken by Cloetta* working in the Pharmacological Institute of the University of Zürich. Heretofore, most of our knowledge of digitalis has centered about the glucoside digitoxin, but there is a considerable literature regarding other digitalis constituents which are reputed to have various attributes. Cloetta has searched diligently to discover what compounds may be present, which act upon the heart. In brief, he has isolated in absolutely pure form two additional glucosides to which he gives the names gitalin and bigitalin. The former name is already in use and applies

* Cloetta, *Archiv für Experimentelle Pathologie und Pharmacologie*, 115: 261, 1926.

to an impure substance which, however, is rich in Cloetta's gitalin; therefore, the retention of the name. Bigitalin has approximately twice the molecular weight of gitalin. These pure substances contain the same carbohydrate grouping which is present in digitoxin, namely digitoxose. They are active qualitatively upon the heart in the same way as digitoxin, but to a less extent, only thirty-three to forty per cent; both are almost insoluble in water though sufficiently soluble to test upon the perfused heart. Gitalin and bigitalin also differ from digitoxin in the ease with which they may be split into their carbohydrate and non-carbohydrate moieties, and in the fact that the resulting non-carbohydrate portions (gitaligenin and bigitaligenin) are much less active and have only one tenth to one twentieth of the effect upon the heart that the corresponding portion of the digitoxin molecule (digitoxogenin) has. Because of this latter fact it is evident that the duration of the therapeutic action of a given digitalis preparation, when given parenterally, will depend somewhat upon the proportions of the three glucosides. If the two new ones described by Cloetta predominate the action would probably not be as enduring as it would be if digitoxin predominated, since the digitoxigenin derived from the latter would still be active while the gitaligenin and bigitaligenin would be but slightly active.

Given by mouth gitalin and bigitalin might be expected to have little action because of destruction in the stomach. The inference is that a galenical preparation of digitalis given by mouth owes its activity largely to the digitoxin content.

The facts stated are of interest in connection with the bio-assay of digitalis. The one-hour frog method usually employed may show but little distinction between the three glucosides since the administration is parenteral (into a lymph sac). The need for such a distinction in the method is apparent from the statements in the preceding paragraph. Cloetta endeavoured, but without avail, to discover a chemical method of assay. The separation of the individual glucosides is extremely difficult, and the colour reactions are so similar that they afford no basis for selective estimation.

No evidence could be found of the existence of any other constituent of digitalis with an action upon the heart. So-called soluble digitoxins are probably non-existent; those stated to occur appear to be mixtures containing one or more of the three glucosides above mentioned held in solution by inert material present in the leaves. Obviously therapeutic preparations of such a nature would be expected to be of doubtful value.

R. L. STEHLE

THE EMETIC ACTION OF THE DIGITALIS GROUP

IN recent years considerable interest has existed concerning the possibility of obtaining therapeutically active preparations of digitalis and its allies which would be devoid of emetic action. The existence of fat-free tinctures still testifies to the lingering belief that emesis is due to substances in the ordinary preparations other than the ingredients active upon the heart. A substance known as digitonin, soluble in fat solvents has claimed most attention. It seems satisfactorily demonstrated now, however, that in sufficient dosage any active digi-

talis preparation, fat free or not, will produce vomiting, hence interest has centered about the mechanism involved. In 1923, Hatcher and Weiss* investigated this mechanism and reached the conclusion that the vomiting was due to a reflex arising from the action of the drug on the heart. The basis for this was the fact that they were unable to produce vomiting in the cat by application of any of the digitalis bodies directly to the vomiting centre, which they localized in

* Hatcher and Weiss, *Journal of Pharmacology and Experimental Therapeutics*, 22: 139, 1923.

the sensory nuclei of the vagi. Failure to vomit following intravenous administration of digitalis also occurred frequently after section of the vagi, or extirpation of the stellate ganglia.

The question has been opened anew by the recent work of Dresbach and Waddell using strophanthidin. The heart of the cat was denervated as thoroughly as seems possible. The stellate and middle cervical ganglia were removed, all connections of the sympathetic chain as far down as the fourth or fifth

ganglion were cut and double vagotomy performed. In spite of this thorough procedure all animals vomited after the administration of strophanthidin. Consequently Dresbach and Waddell are strongly of the opinion that the action is a central one.

The reason for the discrepancy is not apparent. It is true that the same substance was not used in the two sets of experiments but in view of the assumed close chemical relationship this fact would not seem to be the cause. R. L. STEHLÉ

THYROXINE

TO the May number of the *Biochemical Journal* Dr. C. R. Harington of the Department of Pathological Chemistry of University College Hospital Medical School, London, has contributed two extremely important papers which will revolutionize our conception of the constitution and probably also of the method of action of thyroxine, which, it will be remembered, was isolated from the thyroid gland by Dr. E. C. Kendall in 1919, and which contains sixty-five per cent of iodine. Kendall ascribed to this compound the formula $C_{11}H_{10}O_3NI_3$, and considered, on somewhat slender chemical grounds, that it was a derivative of the amino-acid *tryptophane*. Harington has perfected a method which permits the isolation of twenty-five times more thyroxine from equivalent quantities of thyroid than does Kendall's original procedure. This is in itself most important, since at present the price of thyroxine is

prohibitive. He has also shown that the empirical formula is $C_{15}H_{11}O_4NI_4$.

Moreover he has carefully investigated the compound formed after the removal of the iodine, and has succeeded in synthesizing it and thus completely proving its constitution. This compound is the para-hydroxy-phenyl ether of the amino-acid *tyrosine*. Thyroxine thus contains two benzene rings linked through an atom of oxygen; four hydrogen atoms in these rings are replaced by iodine atoms. It would appear to follow that Kendall's theories of the mode of action of thyroxine, based on his own formula, must be discarded. It is further of interest, that thyroxine must now be regarded as a derivative of di-iodo-tyrosine, which is the only other iodized amino-acid, which apparently can be formed by the living cell, and which has been isolated from sponges and corals. We can now hope to make more rapid progress in the study of thyroid function. A. T. CAMERON

SUNLIGHT

SUNLIGHT, or to use the correct term, solar radiation, is composed not only of the visible rays which are perceived as light, but also the invisible heat rays and ultra violet rays. The heat rays are longer than the visible rays and constitute slightly over fifty per cent of the

total energy of the solar radiation. The ultra violet rays are shorter than the visible rays and are very active from the chemical standpoint.

Although physicians have observed for centuries the beneficial effect of sunlight, until recently no scientific proof of any

definite effect of light on the metabolism of the body has been noted. It was first shown some fifty years ago that sunlight retarded the growth of bacteria, and it was later discovered that the action was due almost entirely to the ultra violet rays. It was also observed that the shorter the ultra violet ray the greater was the lethal effect on bacteria. During the past four years it has been shown that the ultra violet rays of sunlight produce a profound influence on the body. A lack of sunlight during the early years of life, when the organism is growing rapidly, results in the development of rickets and tetany, with the accompanying reduction in the concentration of the inorganic phosphorus and calcium in the blood. It has been demonstrated that ultra violet rays increase the resistance of the individual against infection. Blood removed from patients before and after their exposure to ultra violet rays shows a definite increase in the bactericidal power after the patient's exposure to the rays. An increase in the blood platelets and also in the red blood cells has been noted although some observers have not confirmed the latter observation.

Although the mode of action of sunlight on the body is not understood still a number of interesting facts have been revealed through laborious and painstaking experiments. It has been shown that the rays which are effective are the very shortest of the ultra violet rays. These rays, the ones which produce the tanning or pigmentation of the skin, are cut off entirely by glass and clothing so it is necessary for the individual to be

exposed directly to the sun's rays. These rays apparently produce some change in the cholesterol in the skin or as is usually stated "activate" the cholesterol. Exactly what chemical change is produced is still unknown. In any case the "activated" cholesterol is carried by the blood to the various organs where it exerts a vital influence on the metabolism of the body.

The antirachitic vitamine which is present in large quantities in cod liver oil and which produces some of the effects of sunlight, owes its efficiency to "activated" cholesterol. This "activation" of the cholesterol has its origin in the ultra violet rays of sunlight. The sea contains a great deal of vegetable matter, and as water is comparatively permeable to ultra-violet rays a large quantity of this matter no doubt contains "activated" phytosterol the corresponding plant constituent to cholesterol. Small fish eat this vegetable matter and change the phytosterol into cholesterol. The cod live upon these small fish and store the "activated" cholesterol in their livers; from which it is extracted in the manufacture of cod liver oil. In other words the antirachitic vitamine of cod liver oil has its origin in the ultra violet rays of sunlight.

The scientific study of the effect of sunlight on the human organism has already yielded invaluable information. There is little doubt that future investigations of this subject will furnish additional knowledge, which will be of great value in the treatment and prevention of many diseases.

F. F. TISDALL

THE SURGERY OF THE SPLEEN

AT the recent International Surgical Congress held in Rome in the first week in April, a discussion on the surgery of the spleen assumed importance. Professor Henschen of Zurich spoke of the large number of conditions in which splenectomy had recently proved to be of value, and Dr. Beer of New York gave

its operative statistics showing particularly good results in chronic purpura. The *Lancet* (April 24, 1926) in an editorial refers to the facts brought out in this discussion and details the position today of the surgery of this organ.

Operative treatment may be called for when the spleen has been injured; when

its attachments have been abnormally loosened giving rise to the danger of torsion of its pedicle; when it has been invaded by certain organisms especially by the echinococcus; when it is the seat of true tumour formation; and in some enlargements of the organ associated with certain changes in the blood.

In injuries, splenectomy is the procedure of choice even when the rupture is not a large one. Owing to its friability the organ does not allow of suturing, and plugging the wound has been frequently followed by secondary hæmorrhage and sepsis.

The *Lancet* considers that the loss of the spleen seems to be a more serious event for a child during its period of growth than for the adult. When the spleen is abnormally mobile, fixation has brought relief to a number of patients, yet removal is considered the better course, and becomes necessary if any torsion of the pedicle has taken place. Abscesses of the spleen are usually best treated by incision and drainage; by the posterior thoracic route, when they are at the upper pole, and through the abdomen when they are at the lower one. Only very exceptionally when the abscesses remain wholly intrasplenic does the removal of the organ become the proper procedure.

The question of splenectomy, however, arises most frequently in connection with those diseases of obscure pathology associated with enlargement of the organ and changes in the blood picture. In splenic anæmia including Banti's disease, the results of splenectomy are extremely good, particularly if employed before hepatic cirrhosis has developed. Mayo however, recommends that the operation should be performed even in the terminal

stage, as in his experience after the operation some patients have done well and lived for many years. In hæmolytic jaundice, splenectomy is demanded only in the acquired disease, in the opinion of the writer of the editorial.

In Gaucher's disease it appears very doubtful how far splenectomy influences the course of the malady. In pernicious anæmia the operation has been well spoken of by certain surgeons, and it is stated that the mortality has been much reduced by the careful selection of the time to intervene, and with the assistance of blood transfusions. Transient improvement appears to have followed in a few cases, but in the writer's opinion the course of the disease does not appear to be affected to any great degree. In purpura hæmorrhagica the results from splenectomy have been most remarkable, both in the rapidity of the cure and its permanency. Leukæmia has long been regarded as a disease in which surgery was contra-indicated. Mayo however has reported that three patients have lived more than five years, and eight for more than three after removal of the spleen. In the more chronic type of the disease surgery would appear to be justifiable, especially after reduction of the size of the spleen by previous x-ray exposures.

Many of the problems connected with the spleen remain unsolved. For all practical purposes in the treatment of its diseases there is only one procedure permissible for the present, and that is its removal. Where its enlargement is only secondary, its removal may be only alleviative. Much further study is necessary before we can deal with splenic disease in a more rational way.

INCREASED CONTROL OVER THE SALE OF DANGEROUS DRUGS IN GREAT BRITAIN

A CONFERENCE was held recently in London of the representatives of the Ministry of Health, British Medical

Association, and of the Pharmaceutical Society, to discuss measures necessary to remove the dangers arising from the

unrestricted sale of barbitone and other drugs derived from barbituric acid.*

The representatives of the British Medical Association agreed that it was desirable to prohibit the retail sale of these drugs to unauthorized persons except on a medical prescription. As a result of the conference, steps have been taken under the Dangerous Drugs Act to include amongst the drugs therein specified, diethylbarbituric acid and other alkyl, aryl, or metallic derivatives of barbituric acid, whether described as veronal, propional, medinal, dial, or by any other trade name or designation, and any preparation, admixture or other substance containing any of them. The effect of the new regulations will be fourfold. In the first place it will make it unlawful to supply by retail any of these drugs except (a) to a duly qualified medical practitioner, (b) for use in hospitals or similar public institutions, (c) to persons authorized by the Secretary of State, (d) on or in accordance with a prescription given by a duly qualified medical practitioner. In the

second place prescriptions for these drugs must be dated and signed by the practitioner, and bear his address, and they must specify the name and address of the patient, and the total amount of the drug to be supplied on the prescription. In the third place, doctors who dispense their own medicines, and will make an entry in their day book of particulars of the drug, and the name and address of the patient and the date of supply, will not be required to make any further record. There is no obligation to keep any record of purchases. Fourthly and lastly, these drugs may not be supplied more than once on the same prescription, excepting when the prescription directs a repetition in which case, the repetition may take place twice or not exceeding three times and at intervals to be specified in the prescription. The *British Medical Journal* (May 22, 1926) states that the question was afterwards carefully considered by the council of the association, and it was decided that as the necessity of restricting the sale of these drugs appeared to exist, they raised no objection to the issue of the new regulations believing that they would cause the minimum of inconvenience compatible with the object to be attained.

* It is a matter of surprise to the Canadian profession to note how frequently in the medical journals published in Great Britain this drug barbitone is referred to under its trade name veronal, a name which so far as we can judge does not appear to be warranted by the British Pharmacopoeia.

THE INCREASING PREVALENCE OF ENCEPHALITIS LETHARGICA

IN recent numbers of the *British Medical Journal* the increase in the number of cases of encephalitis lethargica during the past few years is noted. The medical officer of health for Manchester states that the number of notified cases in his district during 1924 was 244, and the deaths numbered fifty-two. At the same time the unfortunate mental and moral disabilities which not infrequently follow in the train of this disease in the adult, and its very high mortality when it occurs in early life, call for careful study. An extensive enquiry into this epidemic was made by Dr. St. Clair McClure who reports that during that year 282 persons were notified as suffering from this disease, but careful observations resulted in

only 244 of them being accepted as true cases. The remainder included cases of influenza, tuberculous meningitis, cerebro-spinal fever, cerebral abscess, bronchopneumonia, and typhoid fever. In the majority of cases the diagnosis was unmistakable, but in infants and old people an early diagnosis may be difficult. Examination of the cerebro-spinal fluid proved of the greatest value in excluding other forms of meningitis. The disease appeared to attack both sexes with almost equal frequency. It was met with at all ages, but the incidence was heaviest in those under the age of twenty. School attendance did not appear to have any noticeable influence upon its incidence. It was not until the

epidemic of encephalitis had subsided, that influenza of a severe type began to prevail, but careful investigation produced no evidence of any inter-relationship between these diseases, nor was the relationship of epidemic hiccough to encephalitis definitely determined. Hiccough, however, did occur in some cases as one of the symptoms. In the city of Manchester an epidemic of hiccough preceded the epidemic of encephalitis, and in this epidemic the hiccough persisted for from three to ten days, but was unaccompanied in the majority of cases by other symptoms of meningitis. So far as was observed none of the patients so affected developed afterwards any post-encephalitic symptoms. No definite evidence was presented in the investigation that the two affections were closely associated, although such a possibility could not be excluded.

Vomiting occurred in the beginning of an attack of this type of encephalitis in ten per cent of the cases and headache in thirty-six per cent. Pronounced lethargy with or without nocturnal insomnia was present in seventy-five per cent. Insom-

nia and delirium without lethargy were a marked feature in about thirty per cent. Paralysis of one or more cranial nerves was noted in forty per cent of the cases. Nystagmus in ten per cent, and diplopia in forty-four per cent. In a considerable number of cases diplopia and some drowsiness were the only symptoms noted. It was considered too soon as yet to determine the end results. In fifty-five patients whose illness had begun six months previously, nineteen were totally incapacitated, twenty-six partially so, and in ten recovery appeared to be complete.

During 1920 and 1921, fifty cases of encephalitis occurred. Of these twenty-eight died, and a recent examination of the twenty-two survivors revealed total incapacity in five; seven had apparently recovered completely and the remaining ten were able to follow their employment. Dr. Hill, the medical officer of health for Durham county, referred in his report to the remarkable increase in the cases of this disease notified, from seven cases in 1923 to 110 in 1924. Dr. Hill was of the opinion that the disease is spread by mild unrecognized cases and by carriers.

PREVENTION IN OCCUPATIONAL CANCER

THE total amount of investigation into cancer is so bewildering in its quantity and complexity of aspect, that it is refreshing to come across a piece of this work which shows a certain degree of definite accomplishment.

We have already drawn attention to the observations being made on cancer of the scrotum as an occupational disease, especially amongst mule spinners in cotton industrial works in England. Certain facts were brought out in a report by Messrs. A. H. Southam and S. R. Wilson (*B. M. J.* Nov. 18, 1922) and these were of so convincing a nature that a committee was appointed composed of representatives of employers and workmen, together with technical experts and cancer investigators, to consider the matter. The report of this committee

is now at hand* and valuable practical conclusions have been reached.

The composition of the committee provided for evidence from a variety of sources. It was shown that the "epitheliomatous ulceration" amongst the mule-spinner was more generalized in nature than was at first supposed, and also that it had been in existence for a good many years. In the chimney-sweep this type of ulceration is found to be confined to the scrotum, but in the mule-spinner it was found that in twenty-five per cent of cases the skin of other parts of the body was affected. It was a significant fact, also, that the disease might manifest

* Report of the Departmental Committee appointed to consider evidence as to the Occurrence of Epitheliomatous Ulceration Among Mule Spinners. 1926. H. M. Stationery Office. 1/ net.

itself as long as thirty years after the man had ceased to work at mule-spinning, provided he had been at this kind of work a sufficient length of time. The cancer of the mule spinner was found to be pre-eminently an occupational cancer: taking the age period of 55-75, it was found that the mortality from scrotal cancer in cotton-spinners was one hundred times as great as in the general population.

After careful consideration of all possible factors of causation the committee concluded that the evidence is very much in favour of this disease being caused by the prolonged action of the mineral oils to which the mule-spinner is exposed in the course of his work. There are still two facts which are not clearly explained: (1) that mule-spinner's cancer is not known in other countries, and (2) that although the spinners work in bare feet which are therefore much more saturated with oil, yet epithelioma of the feet amongst them is extremely rare.

Prevention of this form of cancer, therefore, appears to depend very largely on the protection of the men from the lubricating

oil of their machines. It may be possible to evolve an oil which will be innocuous, and it has been recommended by the committee, that this be attempted; it is an additional problem to be solved by oil technologists and pathologists, and is an example of the complexities which surround the problem of cancer. In the meanwhile, however, it is recommended that certain modifications in the machinery be made which will prevent the lubricating oil from being sprayed on to the clothing of the workers: also that there be a periodical examination of the men doing this work, and that there be a continual education of the workers by means of leaflets as to the value of cleanliness and of early notification of symptoms of the disease.

That such inquiries will have effects beyond the limits of their original aims is as inevitable as it is desirable. It is not surprising, therefore, that the committee have drawn attention to the fact that other industries entail exposure to mineral oils with the possibility of a similar liability to cancer.

H. E. MACDERMOT

RAYMOND PEARL ON GROWTH OF POPULATION

IN a volume which appeared recently, Dr. Raymond Pearl* of Johns Hopkins University expounds the theory of population growth from the view of a philosophical biologist. He shows how various rates of growth from that of a colony of rats to that of increase in the population of nations can be described by a simple curve tending to an upper and a lower limit. He shows that in an experimental microcosm of flies the increase in numbers follows the same course as that of a nation of men living under conditions of modern civilization. Passing from civilized to semi-civilized races, from the French to the indigenous population of Algeria, he shows that the same rule holds. In a well written story of modern Algeria he finds that the birth

rate is falling, although he doubts whether the Algerians resort to any contraceptive measures. This fall in the birth rate he regards as evidence of the biological fact that with increasing density of population is invariably associated a decreasing fertility. In his discussion of the differential birth rates of the various classes in society he remarks that the efforts of the eugenists to correct the evils of this differential birth rate by inducing the intellectually superior classes to reproduce more freely has not met with any discernible success, but adds "If it is not possible to make desirable people have more babies, why not try teaching other people how to have fewer." In Professor Pearl's opinion this plan offers the only hope of altering for the better the existing social inequalities in the distribution of the birth rate.

* *The Biology of Population Growth*. By Raymond Pearl, New York, Alfred A. Knopf, 1925.

In summarizing the deductions, which he draws from the evidence cited he states that in his opinion there is an inexorable law of population growth, but he is not so pessimistic about the law as Malthus. Speaking of the Malthusian doctrine he writes "I think the thing which first made me dubious about this inevitable misery doctrine was its seemingly compelling logic; it was so easy to prove logically that it must be so, that I began to be suspicious that it probably was not so at all. Long experience with

experimental work has taught me that a somewhat rough and ready, but on the whole very dependable rule, is that any natural phenomenon, which in advance of the event, can be proved by purely logical processes to be necessarily so, almost invariably turns out upon really competent trial and observation to be in fact not so at all, but quite otherwise. This curious phenomenon is of course not the fault of logical processes of thought but is merely an expression of human fallibility in the matter of the premises."

THE NEW FOREIGN MEMBERS OF THE ROYAL SOCIETY

EIGHT distinguished men of science have been recently elected as foreign members of the Royal Society. Their names are as follows: Professor Martinus Willem Beijerinck of Holland, one of the leading authorities on the physiology of bacteria; Dr. Neils Bohr, professor of physics in Copenhagen University; a director of the Spectroscopic Institute; and founder of the modern theory of the relation between spectroscopy and atomic structure; Dr. Ernst Cohen, professor of physiology and chemistry at Utrecht; Dr. Wilhelm Einthoven, professor of physiology at Ley-

den; and well known for his ingenious work in devising instruments for recording electrical changes in animal and plant tissues; Dr. Karl Ritter von Goebel of Munich; who has published numerous investigations dealing with vegetable morphology; Professor Henry Fairfield Osborne, of Columbia University, New York, and director of the American Museum of Natural History; Professor Max Planck of Berlin, distinguished for his studies in mathematics and physics; and Professor Arnold Sommerfeld of Munich, a well known mathematician and physicist.

Editorial Comments

HEREDITARY PERONEAL ATROPHY

Attention is called in the *Lancet*, May 29, to the very interesting history of a family who for five generations have been affected with an hereditary tendency to the development of peroneal atrophy. Out of 101 descendants twenty-one in the direct line of descent show signs of this crippling defect. We are indebted to Dr. Madge Thurlow Macklin, now of the University of Western Ontario, and Dr. I. Thornley Bowman for a discussion* of this hereditary affection. After detailing the facts these writers conclude that the condition is dominant to the normal

and is not sex-linked; in a large family with one affected parent half the children are likely to develop it whether the signs are apparent at the time of procreation or not. No member of the family reported has inherited more than a single factor for peroneal atrophy, and it is not known what would be the result of inheriting a factor from both parents. The question arises whether it is safe for members of an affected family to marry, and here the present investigators give a pessimistic verdict. They say: "Although it is safe for persons having a dominant factor for disease in their family to marry if they themselves are free of it, the same cannot be said of peroneal atrophy, for one cannot tell

* *Jour. Am. Med. Ass.*, Feb. 27, p. 613.

until one is past middle age and so past the reproductive period whether one has inherited the disease. The only safe rule for all persons who are born of affected parents, or born of parents who died young, but who had come of affected stock, is either not to marry or to take absolutely safe precautionary measures against having children. This applies to unaffected as well as affected children of affected parents." Males and females suffer equally. The disease does not seem to make any difference to the longevity of the individual, but it produces very serious crippling, and Drs. S. Macklin and Bowman consider that strict precautions against having children are necessary, because only thus can it be eradicated from the community; sporadic cases in families, which give no previous history, are explained on the supposition that the parents have the disease latent, and would develop it in later life if they lived long enough.

Arnold Knapp, New York, writing in the *Journal of the American Medical Association*

says: "There is no better way to find out omissions in our work than in attempting to write about it. The necessary thinking over our findings, so as to come to a logical and satisfactory conclusion, is of the greatest value. The gaps in our knowledge and reasoning can be shown up better in writing than by any other means. It is frequently stated by the new observer that he finds nothing worth while to write about. This I think means that he has not sufficiently studied the subject. Since the humblest observations may be the basis for a satisfactory report, it is not necessary to wait for divine inspiration to publish an epoch-making discovery."

Prof. F. Müller, Munich, surprised the recent German Internal Medicine Congress by his denunciation of the "over-production of medical articles, the inability of the younger generation to condense their articles for publication, and the lack of rigorous discrimination by the editors in selecting articles to publish."—*Jour. Am. Med. Ass.*, May 22, p. 1634.

Correspondence

Our Edinburgh Letter

(From our correspondent)

In reviewing the events of the last six months several events seem to call for some remark.

On January 9th the Canadian Curlers arrived in this city and on the 12th two rinks played against representatives of the Edinburgh Medical Curling Club. Though our doctors did not achieve a victory, the result, which was a draw was a happy ending to a most enjoyable and sporting game. As no other club succeeded in drawing with these redoubtable exponents of the "roaring game" the medical curling morale in this city is still standing very high.

On January 9th Sir Hector C. Cameron, C.B.E., M.D., LL.D. Emeritus Professor of Clinical Surgery, Glasgow University, was formally presented with his portrait by Sir Henry Craik, Bart., M.P., on behalf of a wide circle of friends. The painting is the work of Mr. George Henry, R.A. Another portrait of Sir Hector Cameron by Mr. Maurice Griffenhagen, R.A., was handed over to the University authorities by Sir Robert Horne, M.P.

Sir Hector Cameron's name is intimately connected with that of Lord Lister, whose chief

assistant he was in those far off days in Glasgow Royal Infirmary. For many years the profession in Scotland have considered Sir Hector with affectionate regard. In this connection Edinburgh and Glasgow think as one, and unite to do him honour, not only as an eminent surgeon and a true gentleman, but as a most worthy descendant of the good Lochiel, whose intervention alone made the '45 rebellion possible, and of that other gallant Cameron, the friend of the great Montrose.

An appointment that has been hailed with genuine approval has recently been made by Edinburgh University Court. Colonel P. S. Lelean, C.B., C.M.G., F.R.C.S. Eng., has been appointed Professor of Public Health in the University. Professor Lelean was born in Canada in July, 1871. During the South African War he served as a civil surgeon, and from 1906 to 1912 was with the R.A.M.C., in India, where he was mainly employed in sanitation. During the Great War, he served mostly in the East, and held an appointment at General Headquarters in the Egyptian Expeditionary Force. The new professor is the author of numerous scientific publications including a text-book on sanitation in war.

During the War he rendered invaluable service in experimenting with poison gas, and in devising protective methods to combat this weapon, with which Canadians were only too familiar.

Another sign that we are getting further away from the War, is the passing away of Bellahouston Hospital, Glasgow. Only a few wards are to remain open. This hospital was built during the war by the Scottish Branch of the Red Cross Society, on a site granted by the Corporation of the City of Glasgow. At first giving accommodation for 500, it was later extended to 1,200 beds. The buildings are of asbestos sheeting and the cost was £100,000, including equipment, which may be considered cheap for the number of beds. During the three years of the War and in the year following 14,807 sick or wounded from every branch of the Imperial Army received treatment in this hospital, which contains a special orthopaedic and physical therapy departments and curative baths. A year after the close of the War the hospital was handed over in its entirety by the Red Cross to the Pensions Ministry. The simple method of construction and the general arrangement on the one storied bungalow plan, without lifts or stairs, made this one of the best arranged hospitals in the kingdom. The experience at Bellahouston, is not without interest to those who are studying the problem of hospitalization. It was cheap to erect, comparatively inexpensive to run, and for the money expended gave a maximum number of beds.

Recently there has been formed in Edinburgh a Clinical Club. The object of this new venture is to create a society for general practitioners. At the meetings, subjects will be discussed from a practical rather than a scientific aspect. A committee of general practitioners has been appointed and the well attended meetings, that have already taken place, are a proof of the popularity and usefulness of this new society.

The programme for the post-graduate courses to be held in Edinburgh this summer has recently been issued. These courses are held under the auspices of the University and the Royal Colleges of Physicians and Surgeons. The programme includes special courses in obstetrics and gynaecology, diseases of children, and general medicine and surgery. The course in obstetrics and gynaecology starts on July 12th and will last for four weeks. On August 2nd the course on diseases of children commences and terminates at the end of one week. The general medical and surgical courses commence on August 9th and continue for four weeks. In these two courses the programme starts each day at 9 a.m. and lasts with intervals until 6 p.m. Including as they do a wide range of subjects they promise to be both

comprehensive and instructive. Graduates who are unable to attend these courses, but, who wish to visit Edinburgh at other times for the purpose of study are requested to communicate with the Secretary, Post-Graduate Courses in Medicine, University New Buildings, Edinburgh.

The Lister Ward at the Glasgow Royal Infirmary is no more. In the reconstruction of the hospital, which has been proceeding for some time, the retention of the old ward interfered with the plans. It stood on the site where it was proposed to build the new outpatient department. It was found impossible to incorporate it successfully in the suggested scheme for the new department. Considerable interest, and a certain opposition was aroused when the proposed removal of this historic landmark became known. While sympathizing with the managers of the Infirmary in their desire to provide a thoroughly modern institution, one regrets that it has not been found possible to preserve this, the birth-place of antiseptic surgery. In this ward in 1865, Lister commenced the antiseptic treatment of compound fractures. Though later on in Edinburgh and in London he became more famous and performed more important work, it will always be remembered, that it was in Glasgow that the great work commenced.

GEORGE GIBSON

Edinburgh, June 3, 1926

Our London Letter

(From our correspondent)

Impulses in Sensory Nerves Produced by Normal Stimulation of Their End-Organs

Within the last few weeks there have been announced the results of certain experiments by Dr. E. D. Adrian and Miss Cooper of Cambridge, which demonstrate the passage of nerve-impulses in sensory nerves *in situ* produced by the normal stimulation of the sensory end-organs related to these nerves.

This research closes one chapter in electrophysiology and opens another. The chapter which it opens is one devoted to research into the impulses travelling in nerves and the nervous system by the latest methods of physics, the thermionic valve and the kinematographic moving "film." By the use of these delicate apparatuses we seem to be on the verge of a realm of accurate knowledge in neurological bio-physics.

The chapter that has just been closed was begun fifty-five years ago by the late Professors Dewar and MacKendrick when, in an attic in Edinburgh, they proved that light allowed to fall on the surviving retina of a frog's eye produced a current of action in the retina, and in the optic nerve. The preface to that

chapter had been written about thirty years earlier still by Dubois Raymond in Berlin, who showed that a single twitch of a muscle was accompanied by electrical expression.

When MacKendrick placed one non-polarisable electrode on the cornea and the other on the transverse section of the optic nerve of a frog's eye in a dark box, and then, on admitting light for an instant, obtained a galvanometric deflection, he was demonstrating for the first time that the normal (homologous) stimulation of a sensory end-organ is accompanied by an electric disturbance in the related nerve. This electric event has always been regarded as representing an underlying nerve impulse.

It has since been shown that not only light but mechanical pressure on the eyeball, as well as the discharges through it of the shock from a condenser produced exactly the same result—a current of action in the retina and optic nerve.

None of the other sensory end-organs besides the rods and cones of the retina lend themselves at all easily to similar investigation; the auditory nerve being particularly inaccessible.

Where end-organs are not involved, the procedure is quite simple; the direct stimulation of an afferent nerve at one point giving rise to action currents higher up. Further, it was shown by Horsley and Gotch that stimulation of a posterior spinal root produced currents in a galvanometer, in connection with the posterior columns of the spinal cord. In all these previous instances of impulses being produced in afferent nerves, one was never sure of how many fibres were carrying impulses, and one strongly suspected that a large number of fibres were not being simultaneously stimulated.

There was no guarantee that the various phases of the electrical responses were not all mixed up in one confused result, the photograph of which was a kind of algebraic numeration of the rhythms of all the series of impulses. What was wanted was to stimulate a single afferent nerve-fibre through its own proper end-organ, and photograph the electric responses in the nerve. This seemingly impossible task has been successfully accomplished by Dr. E. D. Adrian and Miss Cooper at Cambridge by the use of exceedingly sensitive apparatus. They used the capillary electrometer filled with mercury, in circuit with a three-valve amplifier (Marconi D.E. 56 type) giving a voltage amplification of 1850. The apparatus is so sensitive that it detects a change of potential of only 0.01 millivolts lasting for so short a time as the thousandth of a second. The cinematographic film travelled at the rate of a metre a second.

Dr. Adrian selected the sensory end-organs of muscle as being the most likely, from their histological distribution in a small muscle, to permit of the two following conditions being fulfilled; namely, the application of a steady non-periodic stimulus, and the possibility of being able to stimulate only one nerve fibre at a time. The results have exceeded expectations. The muscle chosen was the very slender sternocutaneous of the frog in which from histological investigation it is known that there are not more than three to four sensory muscle-spindles. The total number of fibres in the slender mixed nerve supplying the muscle is only from twelve to twenty-five, the most of which are motor. The method was to stimulate the sensory spindles by hanging different weights from the muscles for ten seconds, and then taking the photographic record of the series of nerve impulses. When the entire muscle was thus stimulated by a two-gram weight, the photograph showed a complex and irregular series of electric responses following each other as rapidly as 150 in the second. In some records the interval between successive impulses was as short as the thousandth of a second, which is shorter than the refractory period of a frog's nerve; namely, the two thousandth of a second. Thus it was evident that this rapid series of responses was not being given by the same one fibre but by several at once. Very carefully a strip of the muscle was cut away, and the constant stimulus of two grams replaced, the series of responses now became more regular and with longer intervals between the impulses. A second strip removed made the record more regular and still slower; while a third strip (with one gram weight) produced quite a regular series at the much slower rate of twenty-two in the second. Here, then, it was extremely probable that a single sensory spindle was being stimulated by its own homologous stimulus, namely, steady tension; and that the end-organ was therefore discharging into the afferent nerves impulses of about twenty-two to twenty-five a second. The higher rates proved to be compound rhythms in several fibres. It was previously known that a constant stimulus applied to the afferent nerve-fibre itself does not produce a series of impulses at all, but one initial response and no more.

The following conclusion is therefore arrived at, and is of immense consequence to the theory of neural action. The periodicity of the response in the nerve fibre as exhibited by a rhythmic series of electrical events is due to the property of the end-organ to respond to a constant stimulus in a rhythmic fashion.

From a large number of observations, it was inferred that the more irregular and complex the series of responses was, the more likely

was it that several nerve fibres were concerned; and conversely, the more regular the series, the more likely that only one fibre was functionally involved. Where a single end-organ only was supposed to be in action, the effect was next tried of varying the intensity of the stimulus; that is, of hanging on a different weight in each experiment. The weights used were one gram, one-half gram and one-quarter gram, each applied for ten seconds, and then the responses photographed. The stimulus has still no period of its own. Theory, based on previous study of the relations of strength of (artificial) stimuli to responses in nerve, required that the heavier the weight the more rapid would be the frequency of the series of responses, because the stronger the stimulus applied to the nerve, the shorter is the "relative" refractory period produced in the nerve by the passage of an impulse due to a previous stimulus. Conformably to this it was found that one gram produced a rhythm of thirty-three per second, one-half gram, one of twenty-seven, and one-quarter gram one of twenty-one per second. This was strikingly corroborated in an experiment where the stimulus was an amount of oil gradually increased in weight; the rhythm began comparatively slow (sixty-six a second) and ended at one hundred a second. The effects of "adaptation" or relative fatigue of the end-organ were also according to theory, for the longer a stimulus acts the slower one would expect the rhythm of the responses to be. And so it works out, for when a weight of 5 grams, which induced a frequency of 190 per second, had acted for ten seconds the rate fell to 120; 3 grams induced 150 at first which fell to 104, and 1 gram induced 66 which fell to 37.5 after the interval. Employing the same apparatus, Dr. Adrian has investigated several other cases of stimulation of afferent nerves by means of their proper (homologous) stimulus. Using a preparation of the internal saphenous nerve in the cat with the skin stimulated, they obtained the record of a series of impulses in the nerve; in the vagus (cat

and rabbit) with the lungs inflated they recorded impulses, and in the cardiac depressor nerve of the rabbit they found a similar state of matters. In the case of cutaneous stimulation, the skin was nipped by artery forceps or pricked by a pin, both of them aperiodic stimulations, and a series of irregular impulses at an average rate of about four hundred a second was obtained. When no stimulus at all was given to the skin, the nerve was still transmitting impulses, but at a slower rate, namely about 150 a second. The control was to sever the nerve between the patch of skin and the electrodes, when the impulses instantly ceased. Theoretically, these observations are extremely interesting, as they show that a sensory surface like the skin is in reality always discharging into its appropriate afferent nerves a stream of impulses of the order of several hundred per second. The vagus nerve was also investigated; it was divided at the level of the thyroid cartilage, and the peripheral end placed over electrodes. Both cardiac and respiratory waves were obtained; (confirmatory of Einthoven's results in 1911) but Adrian showed that if the lungs were maintained inflated for about twenty seconds, he could record a series of impulses as rapid as with a maximum frequency of 450 per second for short periods. Lastly, the afferent nerve from the heart and aorta was investigated, and again the record of a rapid series was photographed. As long ago as 1903 Tschermak and Koster using a reflecting galvanometer, obtained evidence of a single current of action in the depressor nerve, when the aorta was suddenly artificially distended. By Adrian's far more delicate method, the existence of a very rapid series of impulses in this purely afferent nerve has been proved when no artificial stimulus is present. These researches are of the utmost theoretical importance as giving us reliable experimental data regarding the actual behaviour of the end-organs and conducting paths of the master system in the living body.

D. FRASER HARRIS

Periarterial Sympathectomy.—R. W. McNealy, Chicago, is not prepared to accept either the theory or the practice of the present operation. His experience as well as the reports from other workers would seem to suggest that the operation should be discarded. He insists that a more careful study should be made of the sympathetic nervous system, and that an intensive study of the pathogenesis of various

vascular disturbances should be made before operative procedures are resorted to. The operation of periarterial sympathectomy carries with it some technical difficulties and is accompanied by not a few serious mishaps. The substitution of ramisectomy and ganglionectomy for the present operation will greatly increase operative risk.—*Jour. Am. Med. Ass.*, June 26, 1926.

Men and Books

ABSTRACTS FROM THE EARLY RECORDS
OF THE MONTREAL MEDICO-
CHIRURGICAL SOCIETY*

BY S. HANFORD McKEE, M.D.

Montreal

The Hon. Joseph Howe said, "A wise nation preserves its records, gathers up its muniments, decorates the tombs of the illustrious dead, repairs its great structures, and fosters national pride and love of country by perpetual references to the sacrifices and glories of the past." With that thought in mind, I have carefully examined the minutes taken at the meetings of this Society from its foundation, and purpose bringing to your notice excerpts from its earliest records which will enable you to realize the frame of mind and the work accomplished by our medical forefathers.

It was on the 23rd day of September, 1843, that a meeting of the members of the Medical Faculty of Montreal was held at the house of Dr. Crawford in Little St. James Street, (then a narrow street, in the neighbourhood of the Court House), at which after some consideration it was unanimously decided that "it is very desirable that the members of the medical profession in Montreal should have an opportunity of meeting in a friendly manner for the purpose of communicating together on subjects connected with their profession"; and the undersigned agreed to form themselves into a society for that purpose. The nineteen signatures read as follows: A. F. Holmes, C. F. Bruneau, J. B. Trestler, Archibald Hall, Henry Mount, William Macnider, J. G. Bibaud, James Crawford, G. W. Campbell, C. S. Sewell, W. Sutherland, Frs. Badgley, Arthur Fisher, D. D. Logan, W. Fraser, C. A. Campbell, M. McCulloch, F. C. Arnoldi, Peter Munro.

At a subsequent meeting, by-laws for the Society were adopted, the first one of which reads "that the Society be denominated the Medico-Chirurgical Society of Montreal" a name by which it has been known ever since.

* The Presidential Address read at the meeting of October 3, 1925.

From the 14th of October regular meetings continued to be held for the following two years under the supervision of a committee, under whom the members in turn presided over the discussions which took place. The first president of the Society was Dr. A. F. Holmes. At these meetings many papers of much interest were presented. Among others the following papers appear worthy of mention:

"A description of two cases of paraplegia with an exhibition of the diseased portions of the vertebral column of one of them," presented by Dr. Holmes.

"A report on two cases of placenta prævia," read by Dr. Bruneau.

"A case of apoplexy in a girl of fifteen and one-half years," detailed by Dr. Hall.

"An epidemic of cynanche maligna," described by Dr. Mount.

"A case of apoplexy with no immediate symptoms to excite suspicion of seriousness." An abstract reads as follows:—

"The patient after a severe blow on the head, left his house in search of the police, to whom on his return he committed his opponent. He then retired to bed, but on the following morning was found in an apoplectic condition. At the post mortem a large clot of blood was discovered with rupture of the middle meningeal artery and a fissure three inches long in the parietal bone."

This was presented by Dr. Crawford; and the question of the desirability of trephining was discussed.

A case of bronchocele affecting the right lobe only of the thyroid gland, and producing an extraordinary dyspnœa," presented by Dr. Geo. W. Campbell. An abstract reads as follows:—

"An attempt at treatment was made with potassium iodide. As the dyspnœa increased tracheotomy was done to prevent death by asphyxia and gain time. The relief obtained after operation on the tumour was instantaneous, and the patient was able to leave the hospital in comfort, and undertake her household duties again."

"An account of the existing epidemic of influenza," given by Dr. Sewell.

"The treatment of empyema as practised in Vienna by tapping the thorax, by means of a trocar constructed with a valvular apparatus to prevent the entrance of air," described by Dr. Arthur Fisher.

"The inward fits of children," otherwise

known as "Thymic asthma or laryngismus stridulus," presented by Dr. Fraser.

At the meeting which took place early in January, 1845, the following resolution is found in the minutes:

"That the Medico-Chirurgical Society of Montreal accepts with great pleasure, the proffered co-operation of the Toronto Medico-Chirurgical Society in carrying out the measures originated by them, for the advancement of medical science, the elevation of professional character, and the establishment of union, and cordial feeling, among the members of the profession, the tendency of which cannot but prove of paramount advantage alike to the profession and the public. That the secretary put himself in communication with the secretaries of the Quebec Medical Society, with a view to establishing a friendly correspondence with that Society on the same subject."

On March 8, 1845, remarks were made by many of the members present, on the importance of establishing some bond of union among the members of the profession in Canada, and resolutions to that effect were put on the minutes.

In furtherance of the views expressed in the previous meetings an extraordinary meeting of the Society was held on July 21, 1845, for the purpose of taking steps with the co-operation of the sister societies of Quebec, Toronto and the Niagara District for the establishment of a general medical association for the Province of Canada. Delegates were chosen to meet those to be named by the medical societies in the above named districts, and it was decided that a meeting should be held in this city on the 20th day of August to decide on plans for the foundation of a provincial medical association, and to carry out such measures as may tend to advance the interests of the profession in the province. At the meeting held on September 4th the report of the delegates appointed to meet those from Quebec, Toronto and Niagara was received. An unfortunate disagreement seems to have arisen at the opening of the convention from the fact that Montreal had eight delegates whereas Quebec had only five. A compromise was arranged, and after some discussion it was moved by Dr. Badgley of Montreal, seconded by Dr. Marsden of Three Rivers "that an association of the licensed practitioners of the United Province of Canada be now formed with a view to exciting and encouraging a more extensive cultivation of all departments of medical science, and thereby to elevate the character of the profession; also to superintend, protect and maintain the

rights and privileges of its members." This motion was opposed by the Quebec members and an amendment was proposed by Dr. Rousseau of Quebec, seconded by Dr. Fortier of Three Rivers, that the delegates of the medical profession in the different districts of the province here represented form themselves into a convention for deliberation on subjects of interest to the profession. This amendment was carried, and as by this motion the delegates from Montreal, being representatives only of a local society, felt that they were virtually excluded they withdrew, accompanied by Drs. Hodder and Marsden the delegates from Toronto and Three Rivers, after protesting against this line of conduct. In their report to the Montreal Association its delegates very much deplored this action by the representatives of the Quebec Medical Society. A letter was forwarded to the Quebec Medical Society regretting that any misunderstanding should have occurred and expressing the hope that steps might be taken in the future for the adoption of measures tending to benefit the medical profession of Canada as a whole.

In May 1847 dentists were made eligible for membership in the Association; at the same meeting Dr. Hall read a paper on "the mortality statistics in the City of Montreal" which produced an animated and lengthy discussion, after which the following resolution was passed, "that the paper of Dr. Hall emphasizes the necessity of more accurate returns of the cause of death," consequently it becomes the duty of this Society to point out to the city authorities the defects in the present system of registration and the best mode of remedying it in order that the advantages of accurate statistical returns may be made available to the profession and to the public. A committee was appointed to meet the mayor and to discuss the matter with him.

In the retiring address of the president at the annual meeting, October 1847, the president called attention to the progress of the Society, and its usefulness in advancing the interests of the medical profession and promoting a friendly feeling among its members. He referred also to the medical journal which had been established in the city (*The Montreal Medical Gazette*) and had greatly contributed to increase the respect which was now enter-

tained towards the profession in Montreal. It had also led to the formation of the College of Physicians and Surgeons, a college from which much was expected.

At a meeting early in January 1848, Dr. Campbell gave an account of the appalling character of an epidemic of scarlatina, which had attacked many of the children in Montreal. Three cases of a congestive type were described, which had begun with an inconsiderable throat affection, and with all the usual characteristics of a mild attack and yet without apparent cause the skin previously red became purple, the extremities cold, the pulse almost imperceptible, in one case death had ensued in about an hour.

In the following year, 1849, Dr. Hall read a paper on "Tetanus" to which disease the son of a medical man had fallen a victim. Evidently at that time there was no treatment which was of any avail. In June of the same year Dr. Arnoldi gave the particulars of some severe cases of Asiatic cholera. The discussion which followed this paper showed that there was no mode of treatment which could be relied upon for success. On June 1, 1850, after discussion, it was resolved "that the Medico-Chirurgical Society of Montreal do form the Montreal branch of the British American Medical and Surgical Society, and that a meeting should be called at Three Rivers in July." Evidently this must have fallen through and from March 6, 1852 to June 1865, no meetings were held.

In July, 1865, a meeting of the medical profession of Montreal was called by a circular signed by R. P. Howard, Hector Pelletier, and W. H. Hingston and in response to this call a meeting was held at the Mechanics Institute Hall on July 28, 1865, when thirty-one doctors met "to form a society for the advancement of medical and surgical science in this city and province to be styled the Medico-Chirurgical Society of Montreal." The Society was now re-organized, and at the next meeting the following officers were elected. President, W. H. Hingston; Vice-Presidents, R. P. Howard, I. N. Leprohon; Treasurer, Hector Pelletier; Secretaries, E. Lemire, W. Wood Squire. The minutes of the meetings for some time now were entered in both English and French. Regular meetings were held and at that of January 26, 1866, Dr. God-

frey read a paper on the prevention of cholera. He showed its tendency to follow the watery channels, and showed that its special ravages in the past season were among the citizens who drew their water supply from the St. Lawrence currents which had become impregnated by the cholera virus. He predicted few cases in the invasion now impending except among those labouring in, and near the water. He advised boiling the water as a preventive against this dread disease. At the next meeting cholera quarantine and means for its prevention were taken up and it was decided that the appointment by the city, of an efficient health officer, "with all the powers properly belonging to such office, relieves the members of the profession from the necessity of any further action in this matter."

A further lapse in meetings occurs here, and the next minute reports a meeting held in the Natural History Society Rooms, November 5, 1870, for the purpose of considering the formation of a society for the advancement of medical and surgical science in this city. There were twenty-two present, and Dr. T. G. Roddick acted as secretary of the meeting. Reports of the meetings from now on were published in the *Canada Medical Journal*.

On December 20, 1870, Dr. Fraser gave the meeting an interesting and instructive account of Professor Lister's treatment of surgical cases with carbolic acid, as observed by himself during a recent visit to Great Britain. Following a paper by Dr. Girdwood on a case of "Supposed criminal abortion", it was resolved that "in all cases where the life of an individual is dependent upon the correct interpretation of pathological appearances, or chemical analyses, it should be the duty of the government to employ at least two experts to conduct such investigation, in order to fully satisfy the ends of justice."

At the next meeting Dr. Hingston gave a paper on the necessity of re-vaccination. Discussion was carried on till a late hour and was then adjourned to the next meeting. During the epidemic of smallpox raging at this time, the Society went on record in the public press "as being unanimously in favour of vaccination and re-vaccination". After the summer vacation, meetings were resumed in October, 1872, under the presidency of Dr. R. Palmer Howard.

At the meeting of November 30, 1872, Dr. F.

W. Campbell gave a report on a case of "Ague" in a patient who had never been out of Montreal, and Dr. McEwen gave his experiences with some 200 cases which he had seen in Ontario within a few months.

At the next meeting Dr. Major reported a number of cases of colchicum poisoning. A large Winchester flask containing over five pints of wine of colchicum was stolen from an express cart, and taken to a dive in the city, where it was consumed by seventeen men, women and children, seven of whom died with symptoms of vomiting, diarrhoea and collapse. Following a lengthy discussion, the president expressed, in the name of the Society, the extreme regret of the Society at no post mortem having been afforded at the coroner's inquest, in these and other cases of pathological and medico-legal interest. At this meeting a lengthy and interesting discussion also took place on "Albuminuria in pregnancy."

On November 15, 1874, a ballot was taken on the application of Wm. Osler, who was unanimously elected to membership. Not until the meeting of August 17, 1875, did he make his first contribution to the Society, in a paper on "The pathology of anthracosis or miners' lung." Exhaustive notes, a thorough discussion of the pathology, with wood cuts, drawings and post mortem specimens made up a characteristic Osler presentation. From now on Osler took a very active part in almost every programme, and made frequent presentations of pathological specimens and case reports.

The Society was very active at this time in public health and other civic medical matters, and was constantly suggesting improvements or pointing out deficiencies in these matters.

On the minutes of the meeting of October 27, 1876, the following resolution is found:

"That this Society regrets to learn that the smallpox hospital of this city is not visited daily by an attending physician, and begs to bring the subject before the Mayor and the Board of Health." At this meeting the "open treatment" of wounds and joints was debated. Dr. "X" was refused admission to the Society because of "alleged unprofessional advertising."

At the next meeting the Society was addressed by Alderman McCord, who laid before the Society certain new health by-laws that were being prepared, and especially asked co-operation in the matter of vital statistics. The Society passed a resolution at this meet-

ing suggesting that smallpox, typhoid fever and diphtheria be reported within twenty-four hours of their recognition.

A paper by Dr. Fulton on "shock after injuries" was read at a meeting in 1877. The reader intimated that as stimulants in large quantities produce the same symptoms as shock, benefit could only accrue from the administration of small doses. He preferred opium to alcohol as a stimulant, and raised the question as to the advisability of operating at all in certain severe injuries to the limbs. The exhibition of pathological specimens was not given a place in the regular order of proceedings, to prevent the confusion which formerly attended their exhibition. Osler, as already noted, took a very active part in the Society proceedings. His exhibition of specimens as a rule was combined with a report by the clinician in charge of the case. For the next few years the Society meetings were on a very high plane.

Here is a sample of the pathological exhibits which were given at almost every meeting. 1. Large cirrhotic kidneys. 2. Ruptured ovarian follicle with peritonitis. 3. Cirrhosis of the liver. 4. Fibroid phthisis. 5. The intestine in a fatal case of typhoid fever.

At the first meeting in January, 1878, a paper by Osler on "A case of idiopathic (so-called) hypertrophy and dilatation of the heart" produced great enthusiasm among the members. During 1878, the code of ethics of the Canadian Medical Association was adopted by the Society. At the meeting of March 22, 1878, Osler exhibited a child of four years, with the phenomenon of a "Systolic brain murmur". The murmur was distinct, somewhat musical and could be heard at both ears and over the vertex. An account of the different theories was given by Osler who stated that that of Dr. Juraszky of Heidelberg was the most likely, that the murmur was produced by want of proportion in size between the carotid artery and canal.

At the next meeting a discussion took place as to the cause of the unpleasant symptoms which sometimes followed the passing of a catheter. Some thought they were of a nervous character, while others thought they came from a septic condition of the blood. A discussion on "Excision of a portion of the

rectum for malignant disease" brought up the question whether one was justified in cutting into the peritoneum and whether the operation was justified or not. Dr. Fenwick thought that the fact that the rectum absorbed very sparingly was an argument in favour of the operation forming a barrier to the spread of the disease. The use and abuse of the thermocautery, tubal gestation, the condition of the optic nerves in brain lesions, smallpox and re-vaccination, the use of eserine in ophthalmic practice, tracheotomy for membranous croup, were some of the papers taken up at this time, with a wealth of pathological material. On one occasion a demonstration on a rabbit of the cardio-inhibitory influence of the pneumogastric nerve was given by Dr. Wilkins.

Smallpox seems to have been a constant scourge about this period. Osler in discussing it at the Society said, "There is a general feeling in the western states that Montreal is filled with smallpox. It is fearful to think that in this period of civilization, the pest should have existed here for many years, and for the past ten years in almost epidemic form." Dr. H. Howard said: "The most serious drawback in this province to arousing an interest in this matter was the lamentable ignorance of the people who looked upon everything that happened as of inevitable necessity. Dr. J. C. Cameron brought before the Society the question of the communicability of typhoid fever through contaminated milk. He cited a dairy on the Lachine Road where a case of typhoid had occurred at the milkman's home prior to an outbreak in the city. The well was situated adjacent to an open closet. Out of thirty families supplied with milk thirteen had typhoid fever. Prof. McEachran at the next meeting went elaborately into the question of "The transmissibility of tuberculosis from animals to man."

At the meeting of April 30th, 1879, the following resolution was passed:

"Whereas it is universally admitted that a supply of pure milk is of paramount importance to the well-being of the infantile population; and whereas it has been amply proven that various diseases may be caused by or communicated through unwholesome or impure milk, resolved that the secretary be instructed on the part of this Society, to urge upon the Board of Health, the necessity of enforcing the existing by-laws concerning the inspection of dairies and the examination of milk, and, further, of making arrangements to procure the periodical inspection of all milk-giving cattle, and their

surroundings, by a competent veterinary surgeon, who should report at regular intervals to the Health Officer of the city."

On May 27, 1880, the Society held its first meeting in their own rooms, 14 Phillips Place. From this time on the meetings were very similar to our present ones, and the Society went on the even tenor of its way until 1914. What happened in that year is now history. The part played by members of this Society in the conflict that ensued, has never, to my knowledge, been officially recognized. I happened to find among my papers a membership list of the year 1914, and I find at that time there were on the roll of the Society 181 regular members. Of that number sixty-two served overseas, while seven served at home. It may be that these numbers should be somewhat augmented, but at any rate 38 per cent of our members, and possibly more, took on war service. Is it not a splendid thing that this large percentage of the members of this grand old Society willingly went forth to care for the defenders of the right? In the deaths of R. P. Campbell and John McCrae, our Society and profession met an irreparable loss. Brilliant in mind, kindly in nature, charitable in actions, we could ill afford to spare such lives.

"Best ye in peace—ye Flanders dead.
The fight that ye so bravely lead—
We've taken up. And we will keep
True faith with you, who lie asleep
With each a cross to mark his head
Where once his own life blood ran red
So let your rest be sweet and deep
In Flanders' fields.

Fear not that ye have died for naught
The torch ye threw to us is caught
Ten million hands will hold it high
And Freedom's light shall never die
We've learned the lesson that ye taught
In Flanders' fields."

The notes that have been read to you this evening, often in the actual language of the minutes, have been culled here and there from the Society's records, to demonstrate the atmosphere of the Society in other times. The earnestness and keenness of these men of early days, in their medical and society work, and in their search for truth through pathological examination, are no less remarkable than their unbounded enthusiasm. In matters of public health they were constantly on guard; vital statistics, smallpox, diphtheria, and other infectious diseases, care of the insane, milk supply, tuberculosis, medical legislation, all occupied their construe-

tive attention on numerous occasions. In fact in all matters pertaining to the public weal, the Society was a force because it recognized and accepted its responsibility. The members had their differences, aired in open meeting, but

with it all, one is impressed by a very genuine *esprit de corps*. It was indeed a fine type of men who originated and established the grand medical tradition that is the heritage of this Society.

Medical Societies

CAPE BRETON BRANCH, MEDICAL SOCIETY OF NOVA SCOTIA

ARTIFICIAL PNEUMO-THORAX, PHRENICOTOMY AND THORACOPLASTY

The annual meeting of this Branch was held at Sydney on the eighteenth of May, under the presidency of Dr. John K. MacLeod. The principal address was delivered by Dr. E. V. Hogan, of Halifax, who discussed the surgical treatment of pulmonary tuberculosis. Dr. Hogan prefaced his remarks by commending the programme of the Nova Scotia Tuberculosis Commission to the profession. He then referred to the part which surgery now plays in the treatment of pulmonary tuberculosis. Rest is just as important to the diseased lung as to the diseased joint. Artificial pneumothorax provides this rest in properly selected cases. While it is a comparatively simple operation, it occasionally gives rise to gas embolism and pleural shock, so it is not devoid of danger. As it is often necessary to repeat the operation at intervals, and as it is difficult to determine when this form of compression may safely be discontinued, artificial pneumothorax has its drawbacks. If expansion is permitted to take place too soon, scar tissue (our main line of defence) may break down, activity may be re-established, and encapsulated cavities may be opened up. Serous effusions follow the operation in about 50 per cent of cases, and of these about 5 per cent become purulent. Even without pus formation, effusions may be followed by adhesions.

Because of such limitations to artificial pneumothorax, other surgical procedures have been devised, notably phrenicotomy and extra-pleural thoracoplasty. Phrenicotomy, which is a comparatively simple and safe operation,

paralyses one side of the diaphragm. The main danger lies in mistaking the vagus or the thoracic duct for the phrenic nerve. Should the accessory phrenic nerve escape the operator, the diaphragm will continue to function, so it must be given suitable attention.

After Dr. Hogan had described fully the technique of this operation; and then that of extra-pleural thoracoplasty, he proceeded to discuss the indications for such procedures, which may be summarized as follows: For phrenicotomy alone: (a) acute, highly febrile and progressive types, even if there be considerable activity in the better lung, and when adhesions militate against artificial pneumothorax, or there are contra-indications to thoracoplasty; (b) chronic types with adhesions precluding pneumothorax, and conditions which contra-indicate thoracoplasty; (c) moderately or far advanced cases which are likely to do as well after phrenicotomy as after the more serious thoracoplasty; (d) early types which do not promise good results from ordinary sanatorium treatment. For phrenicotomy combined with pneumothorax: (a) basal adhesions, especially if they cause pain, irritative cough and vomiting; (b) persistent hæmoptysis in spite of pneumothorax; (c) cases requiring a permanent reduction of the size of the thoracic cavity. For phrenicotomy supplementary to thoracoplasty: (a) cases which require improvement before thoracoplasty is undertaken; (b) preliminary to thoracoplasty of upper ribs only; (c) case requiring increased compression owing to extensive disease of lower lobe.

Thoracoplasty should not be undertaken until the patient's condition has been thoroughly investigated by a competent specialist. In general, patients suitable for the operation are

those with moderately or far advanced chronic tuberculosis, with or without hæmoptysis, with or without cavities or empyema, but with the disease confined principally to one lung, who have not been relieved by sanatorium treatment, artificial pneumo-thorax and phrenicotomy, and who are fair surgical risks. Results to be expected are rapid diminution of cough, sputum and fever and striking improvement in the general condition. The statistics from various sources are most encouraging, especially when it is considered that the operation is one which is usually done only after all other means of treatment have proved futile.

The paper was discussed by Dr. J. J. Roy and others, after which the thanks of the Branch was extended to Dr. Hogan.

Dr. Lynch showed an interesting case of umbilical hernia in a child one day old.

It was decided to extend an invitation to the Medical Society of Nova Scotia to hold its 1927 meeting at Sydney.

Officers elected for the new year are as follows: President, Dr. D. W. Archibald, Sydney Mines; Vice-Presidents, Drs. M. G. Thompkins of Dominion; and J. C. Morrison, of New Waterford; Secretary-Treasurer, Dr. H. R. Ross of Sydney. Dr. J. G. B. Lynch of Sydney, who has served as secretary for fifteen years, declined to offer for re-election. He was tendered the hearty thanks of the Society. Drs. D. MacNeil of Glace Bay, D. MacDonald, of North Sydney, and L. J. Johnstone, of Sydney Mines, were appointed to the executive of the Medical Society of Nova Scotia. Drs. J. K. MacLeod, J. J. Roy and J. G. B. Lynch, all of Sydney, were appointed to the executive of the Branch.

ANNUAL MEETING OF THE VALLEY BRANCH, MEDICAL SOCIETY OF NOVA SCOTIA

At the annual meeting of the Branch, held at Wolfville under the presidency of Dr. E. DuVernet, of Digby, on the eleventh of May, Dr. S. N. Miller, of Middleton was made an honorary member to mark his completion of a half century in practice. The afternoon session was devoted to routine business, and the consideration of a paper by Dr. L. L. Crowe, of Bridgetown, on pyloric stenosis in infancy, and case reports by Drs.

L. R. Morse, of Lawrencetown and M. R. Elliot, of Wolfville. In the evening, an address of welcome by Mayor Roach brought forth a suitable response from President DuVernet. Drs. W. H. Eager and Frank Mack, of Halifax, followed with addresses illustrated by lantern slides. Dr. Eager discussed the value of the x-ray in the diagnosis of conditions involving the gall-bladder and spinal cord, emphasizing the importance of some of the newer developments in the utilization of the x-ray. Dr. Mack dealt especially with diagnostic methods in urology, explaining the methods which are now at the disposal of the urologist. Slides prepared from x-ray films, illustrating a variety of renal anomalies and pathological conditions, were demonstrated. Stress was laid on the causes and symptoms of ureteral stricture, and upon the necessity of early and complete investigation of urological cases. The importance of early treatment, especially of obstructive lesions and of tuberculosis, was emphasized.

Officers elected for the new year are as follows: President, Dr. William Grant, Wolfville; Vice-President, Dr. W. R. Dickie, Barton (Digby); A. A. Dechman, Bridgetown, (Annapolis); J. P. McGrath, Kentville, (Kings); Secretary-Treasurer, Dr. C. E. A. DeWitt, Wolfville. Drs. R. O. Bethune of Berwick, L. L. Crowe of Bridgetown, and A. B. Campbell of Yarmouth were appointed to the executive.

W. H. HATTIE

DIATHERMY IN THE TREATMENT OF PNEUMONIA

At a meeting of the section of Electro-Therapeutics of the Royal Society of Medicine on May 21st, Dr. H. Eaton Stewart of New Haven, U.S.A., an officer in the United States Navy, gave an address on diathermy in pneumonia. Dr. Alastair MacGregor presided.

Dr. Eaton Stewart said that he was unaware that any work had been done on the subject when he started his own in 1921, though he discovered later that as far back as 1906 two American workers had experimented along this line. In 1921, at the Marine Hospital in New York, during an epidemic of pneumonia, it was determined to make an experimental trial of diathermy. The experiment was delayed until a case arrived which appeared to have otherwise

no possible chance of recovery. This case, that of a merchant seaman, was believed to be hopeless, and diathermy was given, 2,000 milliamperes for twenty minutes, through the chest, front and back. The clinical improvement was immediate, and the man made an uninterrupted recovery. It was recognized, however, that this might have been an accidental success, and in order to make a study of scientific value a systematic plan was followed for checking the results, and every third case was used as a control. Of forty-one cases treated by diathermy in that first series 17 per cent died, but the results in general were so favourable that they led to a trial of diathermy by a number of workers, who also found that the reduction in mortality compared with the average in similar cases was most definite. The technique varied very little from the first. The electrodes used were of flexible enamel, covered with heavy shaving-soap lather, and were placed directly on the skin. In the treatment of a single lobe in an adult, electrodes of 5 in. by 7 in. were usual, and for two adjacent lobes the size might be 6 in. by 8 in. Flexible electrodes of German silver in the form of chain metal had been used, and had the advantage of adapting themselves to the irregular shape of the chest, but there were certain practical disadvantages attending their use. Experience had also shown the value of using a lower milliamperage than had been thought suitable at first, and the tendency was towards quite small amounts of current. A very usual application was 1,200 to 1,400 ma. for thirty or forty minutes. The frequency of application in hospital cases was limited by the exigencies of the institution, and in the cases which formed the subject of the earlier reports two treatments daily were the maximum that could be given; but in private practice severe cases were treated every four hours. In desperate cases the intensity of the current and the duration and frequency of application were all increased. An impression had gained ground that it was advantageous to have the cardiac area included in the current pathway, even when that area was not affected, and this was borne out by his own experience. The reports so far collected related to between 300 and 400 cases, a sufficient number to justify an answer being given to certain questions, though not sufficient for dogmatic statements. A remarkable fact was that in about 97 per cent of

the cases treated the temperature had dropped by lysis. In many cases the temperature began to fall as early as the second or third day. A lessening of cyanosis, when this was present, had been an almost invariable accompaniment of the treatment. The pulse rate fell slightly as a rule. The respiratory rate was lessened on an average about five a minute, owing to the decreased pain and the increased pulmonary circulation. Perspiration was considerably increased, and this, when not too profuse, probably helped matters by toxic elimination. The deep heat produced by diathermy hastened resolution. In any statements on mortality it was necessary to be very conservative, because the disease was one in which the death rate in different epidemics varied widely. In the cases under review, however, it could be said that the death rate had been about halved. This average death rate of 12.9 per cent was based upon a total number of cases which represented all types of the disease, including streptococcal lobar pneumonia, and occurring at all seasons of the year. No cases, not even those which were moribund, had been refused treatment, and every case which survived to have a second treatment was included in the figures.—*Brit. Med. Jour.*, May 29, 1926.

THE AMERICAN HEALTH CONGRESS

Dr. Lee K. Frankel, Chairman of the National Health Council opened the meeting urging that out of this co-operation of the many associations promoting national health there should come a national body militant for the bodily and mental well-being of every inhabitant of the country. The rescue of children and babies from preventable death now so successful that only one dies where two died a generation ago, was declared by Sir Arthur Newsholme, leading British health authority and official, to be a more urgent subject for public health work than even the prevention of cancer. Nearly a quarter of all deaths of human beings occur before they are six years old, whereas cancer kills the majority of its victims when they have paid back their economic debt to the community, generally with a balance of work for the community to their credit. But, he continued, if out of the cancer researches now in progress there comes a practical prophylaxis, then the prevention of cancer will rank with child hygiene, tuberculosis control, and venereal

disease prevention, as one of the four most important branches of health work.

"Parents would like to know what the normal is in children," Herbert Hoover told the American Health Congress. "If we only knew, it would give a new orientation to all child health endeavours and would transform our thinking from deficiencies to the positive terms of an ideal."

Draft figures which showed that 80 per cent of America's men were below normal physically, contrasted with the fact that 80 per cent of all babies born in America are born perfect, has shocked the illusions of those who had believed that our country of fine climate, abundant food, little poverty and great devotion to children could not help but produce a fit population. With all these advantages enjoyed by ten million American children of pre-school age, yet malnutrition exists in 20 to 25 per cent, postural defects occur in 40 to 50 per cent and 60 to 70 per cent have dental caries. Our work is racial defence; if we want this civilization to march forward toward higher economic standards, to moral and spiritual ideals, it will march only on the feet of healthy children. The breeding grounds of gangsters are over-crowded tenements associated with a subnormal childhood. The antidotes are light and air, food and organized play. The community nurse and the community safeguard to health will succeed far better than a thousand policemen.

Experts vindicated the child who is always curious. Curiosity is the heritage and possession of all children with the possible exception of the idiot and no matter how excessive the curiosity is it can hardly be considered pathological. According to Dr. Edward A. Strecker, of the Jefferson Medical College, Philadelphia, the general assumption that sex curiosity is abnormal is erroneous. Usually children are more curious about sex than about other matters simply because sex has been attractively clothed in mystery. One does not face the question as to whether sex curiosity is to be satisfied or not. The real question is will it be satisfied in a natural constructive manner, or is the child to be left to tap over-available and harmful sources of information. Some of the qualities of mentally sound children were given by Dr. Strecker. There should be included in their make-up the ability and the desire to move, a certain readi-

ness and willingness to imitate, some response to suggestion, a strong leaven of curiosity, an appreciable love of power, a dash of savagery and a seasoning of romancing. There should be intelligence enough to bring out these traits; enough emotional virility to impress the lessons which they teach, and moral judgment to act as a kind of partial check. The marked diminution of these characteristics is a much safer measure of a sick mind than is their excess.

An intelligence test on health for the educated person was devised and given to the congress by Dr. Livingston Farrand, president of Cornell University. It takes the form of a modern decalogue on health, which, condensed, is as follows:

- (1) Know the physiological basis for sound health habits, such as sleep, posture, exercise and proper elimination;
- (2) know types, amounts and proportions of food essential to proper nutrition;
- (3) know principles of normal mental action and conditions underlying common variations from normal states of mind;
- (4) understand sex instinct;
- (5) know factors determining infection and resistance and principles of artificial immunization against infectious diseases;
- (6) know causes and prevention of degenerative diseases sufficiently to offer the prospect of passing through middle life without a breakdown;
- (7) know and be armed against environmental hazards, such as polluted water and milk, housing congestion, poisons in industry, etc.;
- (8) appreciate the necessity of frequent medical and dental examinations;
- (9) choose wisely medical and dental advisers, and realize that the modern practice of medicine is grounded on science, not on mystery, fancy and tradition;
- (10) know the important health problems facing the community, and study the best methods for attacking each problem.

Three of the principal menaces of health in childhood, measles, scarlet fever and diphtheria, have now succumbed to potential control by man through the application of recent medical advances. There is now little excuse for a child to fall ill with diphtheria. The doctor and the public health worker have sure-fire weapons to be used against this disease, both before the illness begins and afterwards. Thousands of school children in the last few years have been given harmless injections of diphtheria toxin-antitoxin, and Dr. William H. Park, New York City health

official, announced to the congress that in New York the deaths have been cut down to one-third and the cases to one-half of what they were in 1919. Before the development of the toxin-antitoxin combination that makes children immune until they have outgrown the period of the greatest diphtheria danger, antitoxin administered at the first sign of the disease cut down deaths to one-fifth. The end of diphtheria would come about if physicians should immunize children, when they reach nine months of age so as to protect them at the most susceptible period of their lives. Following the same path blazed by diphtheria prevention, there is now being applied a test, cure and preventive of scarlet fever. Drs. Dick and Dick, husband and wife on the staff of the Leander McCormick Institute for Infectious Diseases, Chicago, three years ago discovered the germ causing scarlet fever, and devised toxin and serum for detecting, preventing and treating the disease. As yet the work of the Dicks has not been sufficiently used in actual cases on a large scale to allow it to become a part of the general defences of the public, but Dr. John A. Kolmer, of the University of Pennsylvania, told the health workers that the prospects of conquering scarlet fever in the same way that diphtheria is being overcome are splendid.

Measles has long been considered one of the minor ills of youth, but it is now realized that although uncomplicated cases are not particularly dangerous, the after effects of pneumonia, ear trouble and laryngitis make it one of the major hazards of childhood. The success reported by Dr. Rowland G. Freeman, of New York City, in the use of blood from persons recovering from measles, in protecting others against the disease, has created interest among the experts. The blood of the convalescents has been found to protect 50 to 85 per cent of those treated, whereas all but 2 to 4 per cent of those unprotected by either serum or previous disease contract it after exposure. At present the serum, limited in quantity because of the fact that no animal can be made to contract the disease, is being used only to protect infants and sickly children who would not live through the measles.

One of the much-heralded vitamins, that preventing rickets, is produced when ultra-violet light falls on cholesterol or phytosterol, essentials of animal and plant life, and this bottling, of

sunshine makes scientists feel that they are closer to solving one of the problems of life.

The popular superstitions about the effects of moonlight, how fish and timbers rot more readily in moonlight than in dark, for example, may contain valuable hints to science, for some investigators find that polarized light vibrating in one plane only, as moonlight does, makes plants grow faster and starch change to sugar. In this there may be a disease antidote of the future. To Professor John W. M. Bunker, of the Massachusetts Institute of Technology, the shortest rays known to science just discovered by Milikan suggest a new tool that may be of use to future guardians of health.

Dr. Sheppard W. Foster, of Atlanta, president of the American Dental Association, stated that in addition to protecting against various forms of indigestion, neuritis, malnutrition, rheumatism, mental trouble and other disturbances due to poor teeth, proper care of the teeth in childhood would be a profitable investment to schools because it reduces the number of those pupils who habitually repeat grades. He estimated the cost of teaching these curable repeaters at more than a million dollars annually.

America's great army of mental defectives, numbering about a million, can best be handled by the awakening of the social conscience to the scientific interpretation of facts all of us know, Dr. Charles P. Emerson, president of the National Committee on Mental Hygiene, told the congress in evaluating the status of mental hygiene work. Employers, teachers and courts should recognize the limitations of the feeble-minded, he urged, and treat them as children of their mental age. No new laws are needed since those written years ago cover these cases. And the feeble-minded, placed under proper guardianship and prevented from adding to the population, will make good citizens within their capabilities.

The most effective international co-operation in the whole realm of relations between countries occurs in the field of health. Three great projects for international health are under way, each in its own field, and already many diseases have been chased to the frontiers of civilization into the areas still under the rule of the medicine man instead of the physician. An American organization, the International Health Board of the Rockefeller Foundation, has played a large

part in the inauguration of international health co-operation through aiding governments to secure the best equipment and personnel for public health and promoting health campaigns and research throughout the world. Dr. George E. Vincent, president of the Rockefeller Foundation, told the congress that in addition to the progress of the International Congress, the leading nations of the world are giving increased attention to health administration, and placing trained sanitarians in charge of the health of their peoples. In the same vein, Dr. Vincent

said: "He would be hopeful indeed who should at the present time see anything like a millennium of human brotherhood; but at any rate it is obvious that the tendencies now to be seen in the world toward co-operation for health can not fail to draw scientific men everywhere into closer comradeship. So much is clear gain. There is reason to hope that for a time at least the resources of science will be turned from the destruction of human life to the healing of nations."—Abstracted from *Science Supplement*, May 28, 1926.

Abstracts from Current Literature

MEDICINE

Glucose Utilization in Renal Glycosuria. Paulin, J. E., *Arch. Int. Med.*, January, 1926, xxxvii.

The results of the administration of a large dose of glucose on the respiratory quotient, total metabolism, blood sugar and glucose excretion were studied in four cases of renal glycosuria.

Within one-half hour following administration there was a noticeable rise in the respiratory quotient, which reached its highest level from one to one and one-half hours after the ingestion of the glucose. There is also an increase in the basal metabolic rate from 7 per cent to 19 per cent above normal. The amount of glucose utilized averages 16 per cent. The highest blood sugar was 0.170 per cent. It would seem that patients with renal glycosuria store carbohydrate in the same way as normal persons.

LILLIAN A. CHASE

The Clinical Syndrome of Thrombosis of the Coronary Arteries. McNee, J. W., *Quart. Jour. of Med.*, October, 1925, lxxiii, 44-52.

It is well recognized that embolism and thrombosis of large branches of the coronary arteries are causes of sudden death from cardiac infarction, but it quite possible for such thrombosis to occur without immediate death. Hence the importance of being able to recognize a clinical picture diagnostic of this serious cardiac disease. Dr. McNee points out that

there is a very characteristic clinical syndrome in this type of thrombosis, although the textbooks give it scanty attention (*vide* H. A. Christian's paper, *Amer. Heart Jour.*, December, 1925, abstracted in this *Journal*, March, 1926).

The main clinical features in cases of this nature are as follows:

(a) Agonizing pain of varying distribution and duration; it may even simulate the pain of gastric ulcer or biliary colic. Usually it lasts much longer than the pain of angina pectoris. It is not an invariable symptom, but occurs in the majority of cases.

(b) Invariably there is extreme dyspnea, and with this the remarkable facies which is identical in its earthy colour, cyanosis and sweating with that of acute shock, but lasting long after the pain and distress have lessened.

(c) Immediate signs of acute cardiac failure in the heart itself, which is enlarged and feeble; also in the lungs, liver and kidneys. The acute pulmonary edema may suggest an early pneumonic consolidation.

(d) An inconstant but important sign is that of a localized pericardial friction. This is pathognomonic when found in association with a suggestive history.

(e) Fever and a leucocytosis are always present and are important in their being likely to mislead the clinician into diagnosing an acute abdominal or pulmonary condition.

The course and prognosis is very variable. There are many early deaths. Death may

result immediately or in a few weeks, but increasing experience has shown that some patients survive in fair health for a number of years.

Treatment follows the lines laid down by experience in angina pectoris.

H. E. MACDERMOT

Experimental Renal Insufficiency. Anderson, H., *Arch. Int. Med.*, March, 1926, vol. xxxvii, No. 3.

Various attempts have been made to produce experimentally a prolonged renal insufficiency comparable to that of chronic nephritis, but without complete success. Substances such as uranium and methyl guanidin produce only a temporary renal insufficiency, and ligation of portions of the renal blood supply causes a toxic necrosis. A more satisfactory method is the surgical removal of various proportions of the total kidney tissue, although this method is open to the objection that the remaining glomeruli are normal, whereas in chronic nephritis all glomeruli are at least partially closed.

Using the surgical method the author observed the effect of prolonged renal insufficiency on the blood pressure, and the influence of high or low protein diet on the course of renal disease. Varying proportions (up to 68 per cent) of the total kidney tissue of a series of healthy rabbits were removed in two operative stages. At the first operation a wedge-shaped piece was taken from the left kidney; ten days later the right kidney was removed in toto. From the experimental results, the animals are divided into three groups:

Group 1.—This group includes 16 rabbits which died before or shortly after the second operation. The blood pressure remained normal, and there was a slight rise in the blood creatinin.

Group 2.—The 12 animals in this group constitute the operated controls. They were fed on normal diet, and survived the second operation for a time varying from 3 to 167 days. All died of renal insufficiency, but the *blood pressure remained normal* throughout the experiments. There was a marked increase in the concentration of creatinin and urea nitrogen, which bore an inverse ratio to the length of time the animals survived,—those in which the accumulation was slow lived long, and those in which it was rapid died early. This increased con-

centration was found to be in proportion to the amount of kidney tissue removed. The animals were healthy and active until decided retention developed. The urine showed fixation of specific gravity at a low level,—albumin was found only occasionally. At necropsy the kidney remnant uniformly showed hypertrophy. The aorta was normal.

Group 3.—Of the 16 animals in this group, 13 were partially nephrectomized and 3 retained as controls. All were fed a high protein diet (30.5 per cent protein) over varying periods of time up to one year. In the control animals, there was no increase of creatinin or urea nitrogen, and no increase in blood pressure. At necropsy the kidney showed hypertrophy, the liver hydropic changes, and the aorta marked *atherosclerosis*.

In the animals operated on, the creatinin and urea nitrogen rose to high levels. The *blood pressure remained normal* at all times. The urine showed no striking changes. Pregnancy was unaffected, but none of the young survived (cause unknown). The necropsy findings were,—hypertrophy of the kidney with no evidence of tubular or glomerular injury from the diet, and marked *atherosclerosis of the aorta and aortic valves* not extending to the small arteries or arterioles.

The author concludes that hypertension is not caused in rabbits by renal insufficiency *per se*, nor by a high protein diet even in the presence of a low renal function, nor by a prolonged retention of creatinin and urea in the blood. A high protein diet causes hypertrophy of the kidneys in normal rabbits, no further change in the kidney remnant other than increased hypertrophy, a retention of creatinin and urea in the blood of rabbits with reduced kidney substance proportionate to the amount removed, and marked atherosclerosis of the aorta, which is a result neither of low renal function nor of prolonged retention of creatinin and urea in the blood.

C. J. TIDMARSH

Subacute Combined Degeneration of the Spinal Cord and Pernicious Anæmia. Reese, H. H., and Beigler, S. K., *Amer. Jour. Med. Sc.*, Feb., 1926.

Cases occur in which the nervous symptoms of posterolateral tract lesions precede the anæmia. Lately Henneberg has demonstrated that the

primary degenerations of the cord in pernicious anæmia are without inflammatory infiltrations, and has called the neurological picture myelosis. Subacute combined degenerations affect only the white matter, and more the posterior than the lateral tracts, beginning first in the medial area (Burdach) of the cervical cord, gradually descending into the sacral region, and ascending into the medulla and brain.

The degree of nervous disorder is not always parallel with the severity of the blood disease. If the anæmia is severe the course is usually rapid, thus giving no time for the development of changes in the spinal cord. On the other hand, if subacute combined degenerations are numerous, we find also multiple tract degenerations and the blood picture of the pre-anæmic stage. We may, accordingly, find (1) pernicious anæmia without symptoms of involvement of the spinal cord; or with slight changes; (2) pernicious anæmia with the typical picture of myelosis; (3) myelosis with the pre-anæmic stage or without anæmia.

The typical neurological signs are often preceded by weakness, fatigue, pricking sensation in arms and legs, insomnia, delusions and even hallucinations. Examination reveals slightly dilated pupils with sometimes retinal hemorrhages, exaggerated or decreased tendon reflexes, phantom extension, spastic paretic gait, and diminution or loss of the vibratory sense.

The authors find that loss or diminution of vibratory sense is important as an early symptom, being almost invariably found when distinct signs of subacute combined degeneration have not appeared, and is to be considered as suggestive of the development of this disease.

A. G. MORPHY

SURGERY

Trauma and Malignancy. Mock, H. E., and Ellis, J. D., *Jour. Am. Med. Ass.*, Jan. 23, 1926.

These authors point out that the question of the relationship between malignant disease and trauma has become a practical problem. This is because so many employees claim compensation for some variety of malignant disease which they trace back to some injury received while at work. Surgeons and pathologists will be asked frequently for evidence on this point.

The authors therefore instituted an inquiry into the histories of a series of 300 cases of cancer.

The most striking point of their investigation is that the number of cases which according to certain test requirements could be described as being caused by trauma, is extremely small. These requirements were: (1) a definite description by the surgeon at the time of injury; (2) definite proof that no tumour was there before the injury occurred; (3) undoubted evidence of a pathological process continuing at the site of the trauma until a malignant growth appeared. No one case was found to fit all these postulates; but in a few cases there was suggestive evidence that there was a connection between the injury and the tumour.

The authors suggest that the following requirements be applied to cases that are brought before courts and compensation boards. (1) Reasonable proof of trauma of sufficient seriousness to cause definite tissue changes. (2) That the tumour be at the same site as the original injury and that it involve some of the tissue which could have been involved therein. (3) Evidence that no preceding tumour existed at the site of injury. (4) In addition to the history of the trauma, there should be a history of definite bridging signs such as a persistent swelling, or an unhealed wound, or some disturbances in function to show that there was a connection between the two.

It is safe to say that a tumour developing within two weeks of a trauma existed prior to the injury, although some pathologists would disagree with this, since evidence exists to prove that tumours have appeared almost immediately after certain exciting causes. Where a pre-existent malignant growth has been aggravated or accelerated by trauma, the employer should be held responsible, provided aggravation could be shown, and should pay for the permanent disability. He should not however be held responsible for the subsequent death of the patient due to malignancy, since the trauma could not excite to the point of fatality a pre-existent condition which had already doomed the patient; and as regards the hastening of death, this could only be speculation on the part of the medical adviser.

The histories of nine cases are given which apparently fulfill these postulates, thereby plac-

ing them in the class of malignancy related to trauma, and so entitled to compensation.

H. E. MACDERMOT

Pylephlebitis and Liver Abscess Following Appendicitis. Eliason, E. L., *Surg., Gyn. & Obst.*, April, 1926.

Liver abscess may arise through four channels, the portal vein, the hepatic artery, the bile duct, and possibly the lymphatics. The abscesses in hepatic artery infection are small and multiple; when the bile ducts are the pathway the pus is in the bile ducts. If the portal vein is the route we see both pylephlebitis and hepatic abscesses. As a cause appendicitis is by far the most common, the vessels of the mesoappendix and the cæcal branches of the colica dextra being primarily involved.

Experiments by Sérège show that the blood in the portal vein is divided into two currents, one from the superior mesenteric going to the right lobe of the liver, and one from the inferior mesenteric going to the left. Liver abscesses following a pylephlebitis are usually multiple. Congestion surrounds the abscesses and parenchymatous changes occur throughout the liver.

Chills and fever elevation following operation for suppurative appendicitis should always put the surgeon on guard. A chill immediately following operation means a rapid spread of infection into the portal system. The leucocyte count is usually very high. Pain is not a constant symptom. If present it is located in the right upper quadrant, varying from a pleuritic type to a dull ache under the shoulder blade. Pain was present in five cases with multiple abscesses, and in all there was a pleuritic effusion. Jaundice is invariably present and appears early. Tenderness is present over the right lobe and can be elicited by Murphy's fist percussion. If the abscess is solitary and near the under surface of the liver, palpation alone will elicit tenderness. Finger percussion above the 10th rib in the midaxillary line will elicit pain and tenderness. Œdema may occur over the lower ribs in the midaxillary line. The œdema is of the lymphatic type and is sufficient when coupled with the preceding symptoms to warrant exploration. The x-ray findings are practically the same for pylephlebitis and liver abscess as for subdiaphragmatic abscess, *i.e.*, a limitation of motion in the diaphragm. The

mortality rate for fourteen cases studied was 50 per cent, while in those collected from the literature it was 59 per cent.

All of the fourteen cases were operated upon; seven solitary abscesses were drained by a two-stage operation through the chest. The interval between the operation was one day, the exploring needle being inserted again, and when pus was located the abscess was opened with a cautery and drained with a tube. R. V. B. SHIER

The Prevention of the Toxæmia Arising from Burns. Treatment by Tannic Acid. Davidson, Ed. C., *Amer. Jour. of Surg.*, May, 1926.

The treatment as detailed in this paper is directed chiefly against the toxæmia resulting from severe burns, as opposed to the treatment of the initial shock into which a person who is severely burned may lapse quickly. The toxæmia is considered to be due, not to nervous or vascular elements, but to the absorption of partially decomposed or altered protein matter from the burned area. If this explanation is accepted, and experimental evidence appears to indicate it beyond reasonable doubt, the surgeon is faced with the problem of its prevention. As Dr. Davidson points out the toxæmia may be attacked either by forcing fluids and administering large doses of sodium chloride or by using some method to prevent absorption; when thought desirable both methods may be employed.

Forcing fluids naturally tends to the dilution of the toxins already absorbed, and to their more rapid elimination; the sodium chloride restores the chloride balance in the blood which has been found to be invariably low in the case of severe burns.

Prevention of the absorption of the decomposed protein matter is attempted by using as a dressing a material, which will precipitate the toxic substance, and thus render it inert and incapable of absorption. Dr. Davidson recommends tannic acid for this purpose, and has found it answer the requirements admirably; not only does it precipitate the protein substances, but it has also a very marked analgesic action. The technique recommended is briefly as follows: A full dose of morphin is administered and all the blebs are opened; the burned area is then covered with dry sterile gauze and saturated with a freshly prepared 2½ per cent aqueous solution of tannic acid.

Windows are cut in the dressings and the surface examined in 8, 12, 18 and 24 hours. As soon as a thorough tanning is observed all the dressings are removed, and the burns are left exposed to the air, but protected from chilling by a cradle covered with a blanket and with an electric bulb suspended inside.

For second degree burns this is all that is necessary; also for small areas of third degree burns. If there are large areas of third degree burns the sloughs may be more rapidly loosened by the application of moist dressings. This however, should not be done until the sloughs have begun to separate of themselves, and until the area of second degree burns has begun to heal. The too early application of moist dressings has in some instances produced serious results; the precipitated proteins have been redissolved and absorbed, causing a profound toxæmia; even death has ensued after the patient had been apparently perfectly free from toxæmia for a period of weeks.

Those who have used this method have been greatly impressed with its two main features; first, the comfort of the patient after the application of the tannin solution; secondly, the remarkably low temperature and pulse rate which is maintained throughout the case. H. M. ELDER

Iodized Oil (Lipiodol) in Roentgenology. For-
estier, J., (Editorial), *Amer. Jour. of Roent-
genol. and Rad. Ther.*, April, 1926, xv, 352.

The success of making visible organs or cavities by x-rays depends on the contrasts obtained. The use of adventitious agents, such as barium and bismuth or other compounds, is determined by the facility of their employment, immediate non-toxicity and, if to be retained in the human body, their retention or absorption without harm. Iodine is the active agent in the sodium iodide, and the tetraiodophenolphthalein that renders visible the genito-urinary tract and the gall-bladder. Lipiodol introduced by the author and Professor Sicard five years ago depends on iodine also for its visibility. Twenty-five years ago iodized oil was introduced into medicine in France by L. Lafay for intramuscular injection for therapeutic purposes in asthma, arthritis and goitre. It was noted that it was rendered visible by x-ray, was harmless, and was very slowly, but completely, absorbed. The author used it in the epidural and subarachnoid spaces and in

bronchial cavities first; now its use for diagnosis embraces many conditions. Lipiodol is 40 per cent pure iodine in chemical combination with oil of poppy, the iodine is firmly combined in the product and when injected into the human body may take years to be absorbed, but is absolutely harmless and never causes an abscess or a tumour. For pulmonary diagnosis the lipiodol cannula, under indirect or direct vision, or by may be injected into the trachea by a curved puncture through the cricothyroid membrane. It depicts, localizes and outlines all bronchial or pulmonary cavities connecting with the bronchial tree. It may thus be used for the diagnosis of the presence and extent of bronchiectasis, tuberculous cavities, lung abscess, collapsed lung, or for rendering visible foreign bodies, mediastinal tumours, bronchopulmonary fistula, empyemas, etc.

Its cisternal injection will localize spinal cord tumours on account of its weight carrying it rapidly down the cord to any area of compression or growth, such as neurofibromas, intradural tumours or intramedullary ones. The early use of this diagnostic method may show cord pressure before paraplegia ensues in Pott's disease, compression fractures and other bone changes. The author claims that in three years there has been no accident from this product. Quite recently Sicard and Binet have introduced a dilution of lipiodol in olive oil of a lower density, for the localization of the lower limits of medullary compressions and for ventriculography, as also spina bifida occulta. Its use as an epidural injection in chronic sciatica and lumbago may prove of therapeutic value. In general surgery it is of value to replace Beck's paste in producing visibility of sinus and fistulous tracts in connection with solid organs, as the liver, and in tracing bone sinuses to their point of origin in typhoid, tuberculous and pyogenic osteitis. It will also render visible arterial obstructions; it is harmless in the circulation, passes through the capillaries and does not produce fat emboli. Gastric motility may be visualized by capsules of lipiodol in gelatine. Portret in France in 1923 used lipiodol to visualize the uterine and Fallopian tube cavities, and to demonstrate the patency of the tubes. It shows submucous fibroids, polypi, etc. Its antiseptic property, its absorption over a long period and its analgesic property causes therapeusis to follow diagnosis in many conditions. CHAS. K. P. HENRY

ANÆSTHESIA

Post-Graduate Lecture on Circulatory Changes in Anæsthesia and the Use of Oxygen. Hill, Leonard, M.B., F.R.S., *Brit. Med. Jour.*, April 24, 1926, p. 729.

Untoward symptoms and death in nitrous oxide anæsthesia are due to lack of oxygen, not to any toxic effect of the anæsthetic itself. Chloroform causes dilatation and weak action of the heart, and sometimes fibrillary contraction. It relaxes the skeletal muscles which support the veins. The capacity of the veins is so much increased that the whole of the blood from the upper part of the body can drain into them when the body is put into the upright position. In very deep anæsthesia there is also depression of the vasomotor centre so that arterial dilatation may take place. Respiratory movements, acting like a pump, help the circulation greatly. Many capillaries in resting tissues, such as muscle, are normally closed. They may become dilated by chloroform and the blood pool within them be increased. In shock the tone of the body is relaxed and the blood stagnates in the dilated veins and capillaries. Histamine, a product of tissue drainage, dilates the capillaries and is probably associated with the causation of shock. To both pituitrin and adrenalin has been ascribed the function of supporting capillary tone. The main cause of death under chloroform is fibrillation of the heart, which occurs in the initial stages of anæsthesia and may be the consequence of too light an anæsthesia, with struggling or want of air.

Syncope due to fibrillation is to be treated by injecting adrenalin into the left ventricle and by massage of the heart.

Ether is much less toxic than chloroform. The anæsthetic partial pressure of ether is 3.7 to 4 per cent. The solubility of brain tissue for ether is practically the same as that of blood. Large pulmonary ventilation and rapid flow of blood through the brain result in quick anæsthesia.

In every operating room there should be available a cylinder containing oxygen with 5 per cent carbon dioxide. By using this with ether at the beginning of the administration deep breathing and rapid anæsthesia occur. It can be used with benefit at the end of anæsthesia to enable the body to get rid of ether. W. B. HOWELL

On the Toxic Effects Following the Use of Local Anæsthetics. An Analysis of Forty-Three Fatal Cases. *Jour. Am. Med. Ass.*, March, 1924.

Under the direction of a Committee of the American Medical Association a careful investigation was made of all the sudden deaths which have occurred as a consequence of the employment of a local anæsthetic. These unfortunate accidents were found to be much more common than is generally supposed, as the surgeons under whose hands the fatality takes place seldom report them. In the investigation it was found that fatalities had occurred in the employment of almost every local anæsthetic; with the newer synthetic anæsthetics as well as with the older ones. The symptomatology is very similar in all cases; sudden dyspnoea, and extreme pallor quickly followed by a complete arrest of respiration. When these symptoms come on within a few minutes after the administration of the anæsthetic, one is justified in attributing the death to the anæsthetic. In these sudden deaths it is quite possible that individual susceptibilities may have a part, but in the opinion of the committee more emphasis should be laid upon the concentration of the solution than upon the somewhat nebulous factor of personal susceptibility.

The committee deprecates the use of morphin and adrenalin in the treatment of toxic symptoms after they manifest themselves, though the use of these drugs as a pre-operative measure may be advisable. The following table is a report of the ascertained deaths, which during recent years have occurred under local anæsthesia, and the special anæsthetic agent which was employed: Alypin 1, apothecin 4, butyn 4, butyn and cocain 1, cocain (alone and with procain) 26, procain (novocain) 2, stovain 1, not classified 2, due to other causes 2; total 43.

In the report it is questioned whether one of the deaths attributed to procain was really due to the anæsthetic. When one considers the very general use of the drug in the production of local anæsthesia, as compared to the comparatively restricted use of all the other local anæsthetics, with the possible exception of cocain, it would appear that this drug procain or novocain is certainly much the safest of anæsthetic agents, although at times it may be dangerous.

With regard to the pathology the reports of

twenty autopsies are all practically unanimous in affirming that there are no definite pathological lesions, other than the systemic congestion which is reported to be the usual finding in these cases.

In reference to the synergistic action of adrenalin it appears to be fairly established that the addition of adrenalin increases the toxic effects of cocain, but has the opposite action of decreasing the toxic effects of procain or novocain. Another important fact which was emphasized is that anaesthetized animals will tolerate a very much smaller dose of the local anaesthetic than the non-anaesthetized. Since the physiological action appears to be almost entirely upon the respiratory centre, morphin as an antidote is obviously an unsound and irrational procedure. Artificial respiration and possibly heart massage are recommended. In the case of procain or novocain, which is chiefly destroyed in the liver, the administration of adrenalin is recommended as it is most important that the circulation be kept up. With regard to the toxicity of adrenalin itself the only type of case in which it is ever dangerous is one of hyperthyroidism. Even in this condition there is considerable controversy and much experimental and clinical evidence both for and against.

H. M. ELDER

OBSTETRICS

The Cautery Treatment of Chronic Endocervicitis. Dave, C. H., *Jour. Am. Med. Ass.*, June 5, 1926.

Chronic endocervicitis is an infection due to trauma, whether chemical or mechanical, of the cervical glands near the external os. It occurs in 80 per cent of married women and in 38 per cent of single women. Cervical erosions due to chronic irritations from the mucopurulent discharge, are a common complication of endocervicitis. Since long-continued irritation predisposes to cancer, the treatment of this condition is of great importance.

Every gynaecological patient should not only be examined bimanually, but also with a speculum, since endocervicitis is often a factor in producing dysmenorrhœa, sterility, backache, menorrhagia, pelvic pain, etc.

High amputation of the cervix will, of course, cure the condition, but should be avoided during

the child-bearing period, since patients so often abort after it. It also involves hospitalization. Hunner's method, later modified by Dickinson, of linear cauterization of the infected area has been found entirely successful. A light weight cautery tip is placed against the cervix and the current turned on by pressing the button on the handle. As sufficient depth is reached the tip is gradually moved, so as to make a line through the diseased tissue. An anæsthetic is very rarely necessary, for should the patient complain of pain, the current can instantly be shut off. One treatment is usually enough although occasionally two or even three have been thought necessary to entirely cure the disease. Following the treatment there is an increase in discharge for two weeks, and the succeeding period is often more profuse than normally. Douches are not recommended, but the cervix and vagina are swabbed out every two weeks with mercurochrome. The cautery is contraindicated during an acute inflammation either of the cervix or tubes, and in syphilis of the cervix.

ELEANOR PERCIVAL

Pulmonary Tuberculosis Complicated by Pregnancy. McIlroy, Louise, *Proc. Roy. Soc. Med.*, April, 1926.

That pulmonary tuberculosis is a serious complication of pregnancy is granted by all, but methods of treatment differ widely. It has little influence on fertility and spontaneous abortion is not the rule, hence interference by the obstetrician cannot be expected to exercise much effect on the disease. Tuberculosis is not due to pregnancy, as is the case in toxæmia, and therefore British obstetricians are tending to reduce the number of induced abortions, and are treating the disease. The ovum is rarely infected, and children born of tuberculous mothers are usually healthy.

Bar recommends induction if the disease is curable. But induction should not be considered after the twentieth week. Labours should be made as painless as possible.

The after care of the mother and child is important. The infant should be isolated from the mother, and proper treatment in the open air instituted. Further pregnancies should be avoided for two years after all active symptoms have disappeared.

ELEANOR PERCIVAL

Miscellaneous

THE ACCELERATION OF GROWTH

By Professor Thomas B. Osborne and
Lafayette B. Mendel

The factors which determine the possibility of growth may be classed, with respect to the organism involved, as internal or external in character. The internal factors include the real impulse to grow, of whatever nature it may be; in part they are inherited, they belong to the permanent biological characteristics of the individual. Heredity, with all that it involves, determines the most potent of these internal, constitutional incentives and conditions of growth. These are the determinants which are largely beyond our immediate control, yet must be reckoned with when defects of growth appear. The external factors, such as air, light, warmth, food, etc., that modify growth, on the other hand, are more amenable to directive regulation. The environment as well as the food of the individual can be modified more or less at will. Here, then, is a possible point of attack.

From time to time we have observed instances of exceptionally rapid growth under conditions of diet and environment seemingly the same as those to which animals exhibiting the average rate of growth were subjected. This in itself indicates a *possibility* of largely accelerated growth that might be secured more generally, if the underlying causes could be correctly ascertained. Chance observations indicated to us some time ago that diet may be concerned therein. An outstanding illustration is afforded by rats—selected, it must be remembered, from our stock colony—that have grown from a body weight of 60 gms. to 200 gms. in less than twenty-five days, in contrast with approximately seventy days usually required by comparable animals. Records of these unusual accelerations of growth will be exhibited.

It need not be assumed that food itself determines the rate of growth; it merely gives the natural growth impulse fair play in a way that may not always have been recognized hitherto. The maximum size of animals grow-

ing at these accelerated rates is in general not unduly large, although frequently it has been decidedly larger than the average. The possibilities here involved raise numerous questions of both theoretical and practical interest. First of all, what is the nature of the chemical substances that may be responsible for the phenomena? Are we dealing with a more adequate supply of some essential that is ordinarily present in suboptimal proportions in the diet? Are there specific stimulants to growth? The effect that growth at highly increased rates may have upon the normal development of individual organs and the correlation of organ systems needs to be ascertained; likewise any influence upon the development of maturity, as represented by the capacity to breed. Indeed, it remains to be determined whether the maximal opportunity for the growth impulse may perchance lead to physiological detriment, while chronological advantages are secured.—*Science*, May 21, 1926.

AUTO-EXPERIMENTS

Medicine has been described as a noble profession but as, not to put it lower, a disastrously bad trade; some might regard it as also a dangerous trade, for the worry, hurry, and scurry over meals favour the incidence of angina pectoris, which has been called "the doctor's disease," and of duodenal ulcer. In addition the exposure to infection may well play a part in making the average duration of life among the healers of bodily ills so much less than that of those who save souls. In an interesting article on "Men who have experimented on themselves" Professor Fraser Harris touches on the risks which those who fight disease take in the day's work, just as the sailor and soldier do, and recalls the days before the discovery of antidiphtherial serum, when the expulsion of mucus and membrane at the then frequent tracheotomies might infect the saviour of the child's life. He goes on to relate instances of impaired vision from prolonged microscopical work, from the time of the young Dutchman, Jan Swammerdam down

to a friend of his own who suffered for his energy in search of the spirochæte soon after Schaudinn's announcement of his discovery. He refers to Dr. J. S. Haldane's and Professor Joseph Barcroft's self-sacrifice in connexion with carbon monoxide and diminished oxygen pressure, to Professor Leonard Hill and his students sitting in such a stagnant atmosphere that cigarettes would not light, and to Chittenden's minimum protein dietary. He also refers to a most distinguished neurologist whose name is left blank, and is stated to have "cut his own *ulnar* nerve at the elbow and observed the phenomena for himself"; this has some resemblance to "A human experiment in nerve division," giving the observations made with the late Dr. Rivers on the sensory phenomena following division of the radial and external cutaneous nerves in Dr. Henry Head's left arm on April 25th, 1903. To the well known story of Sir James Y. Simpson's experiments with chloroform he adds an account of the butler's enthusiastic administration of the new anæsthetic in "a richt guid wille-waught" of champagne to the cook, who in a few moments was prostrated on the kitchen floor, and his advice to his master: "Stick to the chlory, Sir James, stick to the chlory."—*Brit. Med. Jour.*, May 29, 1926.

Edit. Note. Reference should also be made to the many medical men who have risked their lives in carrying out researches for the discovery of the causative agents of our many infectious diseases; not a few of whom laid down their lives in their life-saving quest.

PREHISTORIC FOOTPRINTS FROM THE GRAND CANYON

New finds of footprints of reptiles left in soft sand at least 25,000,000 years ago have just been made in sandstone 1,800 feet down from the rim of the Grand Canyon. This is the greatest depth in the canyon at which such prints have been found.

The prehistoric tracks were found by Charles W. Gilmore, curator of vertebrate paleontology of the National Museum, and will be added to the government's fine collection of footprints of the Permian Age. Mr. Gilmore, who recently returned to Washington, spent three weeks in

Arizona, and obtained from the canyon a ton and a half of material containing fossil tracks of reptiles and prints of plants.

The fact that the prints were found 1,800 feet from the top of the canyon means that after these queer, long extinct reptiles impressed their feet in what was then moist sand, almost 2,000 feet of rock material was slowly piled up in successive strata above the prints. And this does not take into account many additional hundreds of feet of material that have been eroded off from the present top of the canyon wall. So the length of time required for the deep canyon to form was obviously stupendous. The level at which the fossil plants and reptiles have been found belongs to the later part of the carboniferous period, or the time when the great coal beds of the world were being formed, and was a few million years before the famous reign of the dinosaurs. One specimen brought back by Mr. Gilmore shows a row of tracks very much like mouse tracks impressed in a small slab of red stone, and in among the tiny footprints is a wavy line which represents the track of the animal's tail. Other exhibits show prints larger than a man's hand, indicating that some of the reptilian creatures of this age may have become as large as crocodiles. No bones of these creatures have been found in the Grand Canyon, though some bones of reptiles making similar tracks have been found elsewhere.—*Science*, May 21, 1926.

AMERICAN MEDICAL LIBRARIES

Some interesting particulars with regard to medical and other special libraries in the United States have been gathered by the League of Nations Committee on Intellectual Co-operation. The greatest American library, perhaps the greatest medical library in the world, for purposes of historical research is the library of the Surgeon-General's Office at Washington. It contains 304,000 volumes, and, thanks to its printed catalogue, and especially to its very numerous analytical references, the library is declared by the Committee on Intellectual Co-operation to be the best existing example of the bibliographical method applied concretely to the organization of records of intellectual work on a large scale. In Washington there are three other medical libraries—one of them at the naval

medical school, another a library of public health, and the third a collection of works on deafness. In New York there are ten medical libraries, three of them of the first order. In Boston six such libraries exist, including the library of the Harvard Medical School. Chicago has three medical libraries, of which the largest is the Rush library, with 25,000 volumes. These are supplemented by another Chicago institution, the John Crerar library, with about half a million books, covering, however, not only medicine, but social sciences and technicology. In California there are only two medical libraries, and those not of the first order. In North America there is a Medical Library Association, which has (or had recently) a Canadian president. The committee also refers to the promotion in various fields, though rather casually, of the method of making abstracts. The most typical and extensive example of the system in America is in chemistry, and the same thing is now being carried through in the field of the biological sciences. The publication of these abstracts is promoted by the National Research

Council. Of the general libraries in the States the Library of Congress, with upwards of three million volumes, and increasing at the rate of 90,000 a year, is the largest. New York public library, with 2,500,000 books, is the leading municipal library, and Harvard has the principal university library, though at one point or another it is being run close by Yale and Columbia. Harvard spends nearly £30,000 a year on books, and adds 90,000 volumes to its presses. Another line of American investigation undertaken by the League committee is the ascertainment of the number of foreign medical students at American colleges and universities. The number of such students is just under 400—a larger number than in any other faculty except engineering. The majority of these medical students come from China, Japan, the Philippines, the West Indies, and Canada. Only five students from Great Britain and one from Ireland were studying medicine in the United States when the figures were taken. Of the foreign students in dentistry, numbering in all 252, eleven came from Great Britain.—*Brit. Med. Jour.*, May, 1926.

Enlarged Tuberculous Tracheobronchial Glands Simulating Asthma.—Among several hundred children under the observation of M. Murray Peshkin and A. H. Fineman, New York, in an asthma clinic the last four years, three were encountered in whom enlarged tuberculous tracheobronchial glands produced symptoms markedly simulating asthma. This condition is confined largely to infants and young children. The usual history is that during the first year of life the child gradually begins to wheeze. These symptoms persist with no relief or remission. The mother is informed that the child has asthma but cannot understand why the baby does not improve. There may be a low grade fever, vomiting and perspiration, which may continue for one year or more. The infant presents a pinched appearance. The *alæ nasi* overact. Respiration is greatly embarrassed. The distress is greater than that seen in the average asthmatic child. An expiratory dyspnea suggestive of bronchial obstruction is characteristic. There are numerous rhonchi, and loud

sibilant and sonorous râles throughout both lungs like a human music box. These can be heard throughout the room. The breath sounds are usually diminished on one side, where there may be a hyperresonant note suggestive of unilateral emphysema. This finding is of diagnostic importance. There may be dullness at one of the bases. The spleen and liver are often enlarged. A rhythmic motion of the head occurring in extreme cases is mentioned by Bougarel, Schick and Finkelstein. The subcutaneous injection of epinephrine hydrochloride (1:1,000) even in repeated doses does not offer relief. The Pirquet test is always positive and can readily be confirmed by the Mantoux test. A positive tuberculin reaction in an infant or child of from 1 to 2 years of age with a persistent wheeze is very significant. It immediately suggests enlarged tuberculous tracheobronchial glands. The most plausible explanation for this condition is the mechanical obstruction theory advanced by Schick.—*Jour. Am. Med. Ass.*, May 8, 1926.

Obituaries

DR. ALISON CUMMING

Last week in Vancouver, Dr. Alison Cumming died of pernicious anemia after a long and painful illness, thus bringing to a close at an early age, the career of a man who was an outstanding figure among the men of his college year and of his chosen profession. Born in Scotsburn, Nova Scotia, he graduated in arts from Dalhousie University, and later lived for several years in the West Indies, where he contracted chronic malaria. He entered McGill Medical School in 1901, and throughout his college course was identified with all the different university and class activities, athletic, executive and social. Graduating well up in his year, he was for two years on the resident staff of the Royal Victoria Hospital, and left there to become superintendent of the Vancouver General Hospital, a post which he held for several years. Since going west twenty years ago, Dr. Cumming never returned to the east, except for a rather rare visit, when he would look up, and rejoice his old friends. Never endowed with robust health, but keen, well balanced, and affectionate, "the Deacon" as he was known among his many intimates, was always a personality in any gathering, and it was with consternation that his illness became known. Our sincere sympathy goes out to his wife and family, and also to those friends and colleagues with whom he has lately been more closely associated; his loss cannot but be greatly felt by all of those with whom he came in contact.

R. H. M. HARDISTY

Mr. Stephen Paget, F.R.C.S., died on Saturday, May 5th, at his home in Limpsfield, Surrey. For the past two years he had lived as an invalid owing to a right sided hemiplegia.

Born in 1855, Stephen Paget was the fourth son of the late Sir James Paget first baronet, the well known sergeant-surgeon to Queen Victoria, and a versatile writer on medical subjects. Paget was educated at Shrewsbury and at Christ Church, Oxford, and studied medicine at St. Bartholomew's Hospital, and is best known for his writings on medical history and biography. In 1897 he wrote for the Masters of Medicine Series an admirable "Life of John Hunter", and in the same year "Ambroise Paré and his Times", he also wrote the "Memoirs of Sir James Paget," his father. One of the latest of his biographies was the "Life of Sir Victor Horsley." The affairs and interests of the Research Defence Society were for many years Paget's chief concern. He entered into innumerable controversies with the Hon. Stephen Coleridge, the director of the National Anti-Vivisection Society. The most famous of these terminated in a law-suit, when Mr. Coleridge had to pay a large sum in damages to Professors Baylis and Starling of the Department of Physiology at University College, London. Nearly thirty years ago, Stephen Paget published under the title "Experiments on Animals" a most valuable résumé of all the benefits that have occurred to physiology, pathology and medicine by experiments on animals. To this work Lord Lister contributed a thoughtful preface. In 1912 Paget followed up this controversy with a small volume "For and against experiments on animals" for which Lord Cromer wrote the preface. This volume presented a very helpful discussion of all the evidence taken before the second commission on vivisection which published its report in 1912.

Mr. Paget was a delightful essayist having an easy and pleasant style. Some of his essays are: The Young People, 1906; *Confessio Medici*, 1908; Pasteur and after Pasteur, 1912; Essays for boys and girls, 1915. He had

a charming personality and a gentle and lovable disposition, and a great capacity for making friends. His funeral on May 12th in the Parish Church of Limpsfield was very largely attended.

D. FRASER HARRIS

Dr. James Stafford Quinn, a graduate of Queen's University died in Preston the last week in May.

Dr. E. M. Copeland of London, Ontario, died in that city on May 17th, age sixty-seven years, he was a graduate of the Western Medical College in 1891.

Dr. Henry Hunt one of the old practitioners of the province died in Toronto on May 20th in his seventy-ninth year. A graduate of McGill University in 1876, Dr. Hunt had practiced continually for fifty years, thirty-eight of this period was spent in Toronto, and for many years Dr. Hunt was on the staff of the Western Hospital. He was one of the oldest members of the Ontario Medical Association and for long had been interested in public health and natural history, an interest which he kept up to the end.

Dr. Warren White so well known to all those who were medical students in the early nineties died in Niagara on May 27th. A son of the late Dr. Thomas White, a nephew of the late Dr. James White of Hamilton, he early leaned towards medicine and entered the University of Toronto Medical Faculty graduating in 1898. While at the university and earlier when at Upper Canada College he became a well known figure in both the rugby and the cricket teams. After graduating Dr. White practiced in Hamilton for some years, until the very positive threat of tuberculosis compelled him to relinquish his activities, and for the last fifteen years he has been living quietly on his farm at Niagara. Known to every one as "Deacon", Warren White was one of the men who went through college and university making friends in whatever direction he turned, and it is with no insincerity that one says that he will long be remembered as one of the most interesting and lovable of the older members of the profession.

Dr. Howard Douglas Fritz, B.A., died at his residence in St. John towards the end of May. Dr. Fritz was a graduate in arts in 1884 of the University of New Brunswick, and a graduate in medicine of the University of McGill in 1888. Dr. Fritz had a distinguished academic career in arts and especially in medicine and long practised his speciality as oculist and aurist in St. John. His exceptional ability in eye problems that had to deal with refraction was recognized by his colleagues. The sympathy of the profession is extended to his widow and family.

Dr. David R. Moore of Stanley, N.B., died in the month of June at his home. Dr. Moore was a graduate in medicine of the University of Vermont in 1879, but after settling in Stanley he made that town his home, and became closely connected with its community, both professionally and in a business way; he was interested in the local branch railroad and other industrial concerns. Dr. Moore was well known as an author and frequently contributed papers to the New Brunswick Medical Association meetings.

The news of the recent death of Dr. Ives Anglin was received with deep regret by his many friends. Dr. Anglin was the son of Dr. J. V. Anglin, superintendent of the Provincial Hospital at St. John. After he had completed the medical course at McGill he obtained

the position of interne at the Royal Victoria Hospital in Montreal. Shortly after he returned home he became the victim of malignant disease of the bowel. Both as a student and an interne in the hospital he had given promise of a brilliant future. His early death before his medical career had scarcely begun is deeply regretted by all his confrères.

Dr. John Allingham, B.A., M.D., C.M., F.A.C.S., died June 3rd in the General Public Hospital, in St. John, at the early age of thirty-nine years after a short illness of only one week. Dr. Allingham was born in Fairville, N.B., the son of H. P. Allingham, Esq. He was educated at the St. John High School, and at the University of New Brunswick and completed his medical education at McGill University. He

practised in Westfield, Fairville and St. John. He was a member of the American College of Surgeons, past president of the New Brunswick Medical Society, a senior surgeon at the Saint John Public Hospital and surgeon to the Saint John County Hospital. Dr. Allingham in the last few years had successfully performed some brilliant surgery in cases of pulmonary tuberculosis. In his hands the operations for thoracoplasty and phrenicotomy had enjoyed an unusual success. His loss is keenly felt in the profession throughout the Maritime Provinces and especially by his colleagues in the local hospitals; he will be greatly mourned by his patients and by the general public of St. John. Dr. Allingham was one of the most genial companions. His funeral was a very large one and resembled a civic tribute.

A. STANLEY KIRKLAND

Medical News from the British Empire

GREAT BRITAIN

We learn with deep regret of the death of Sir William Leishman, Director-General, A.M.S., after a short illness.

The appointment of Dr. B. P. Watson, at present professor of midwifery and diseases of women in the University of Edinburgh, to be professor of obstetrics and gynaecology in Columbia University, and director of the Sloane Hospital for Women, New York, is now officially announced. Professor Watson will leave Edinburgh about the middle of August.

We learn from *Nature* that a memorial lectureship and medal have been founded at the University of Glasgow in commemoration of the late Professor Sir William Macewen, F.R.S. The lectureship will be biennial, and the memorial lecture will deal with advances in surgery. The memorial medal will be awarded annually to the most distinguished candidate in the final or qualifying examinations in surgery of the year.

Dr. A. J. Clark, professor of pharmacology at University College, London, has been appointed to succeed the late Professor Cushny at Edinburgh. Professor Clark is a graduate of Cambridge (M.B. 1910, M.D. 1914), and received his medical education at St. Bartholomew's Hospital. After serving as lecturer on pharmacology at Guy's Hospital, he was appointed professor of pharmacology in the University of Cape-town; from there he was translated to University College, London. He is the author of a work on *Applied Pharmacology*, and of numerous contributions to the *Journal of Physiology* and other scientific periodicals. He served during the war, and received the Military Cross. It is expected that he will take up the duties of the chair in Edinburgh next October.

At a recent meeting of the London County Council, Lord Monk Bretton, Chairman of the Parliamentary Committee, gave explanations as to the future of the site of Bethlem Hospital which was recently purchased by Lord Rothermere for a public park to be named after his mother, the late Geraldine Mary Harmsworth. The Corporation of London are the freeholders and, in consideration of the Monks Orchard site of the new hospital being handed over to them they will vest the South London freehold in the London County Council. The old buildings are to be removed by the governors of Bethlem "unless otherwise agreed between the governors, Lord Rothermere, and the Council." It is

greatly to be hoped that these interesting buildings will be preserved.

The *British Journal of Nursing* for May contains the announcement of an anonymous donation of more than £100,000 to found a British College of Nurses, to be composed at first of Foundation Members, all of whom will be registered women nurses, and of Foundation Fellows occupying responsible official positions in the nursing world. After an initial period of grace, membership will be limited to registered nurses who pass an examination and pay an entrance fee. The Council of the College will appoint lecturers, teachers, inspectors, and examiners; will offer legal advice to its members and fellows, and provide for their assistance in sickness, accident, or old age. Fellows will be required to take a solemn oath and to give an undertaking of professional and personal conduct, and members of the Council will be entitled to wear a distinctive academic robe.

During the general strike a large number of students attending the Universities took the place of men on strike in matters such as driving trams, occupying posts on the railway, in power-houses, and other places for which their special knowledge or technical training eminently fitted them. In view of the fact that they were doing work of national importance, they were freed by the Universities from attendance on their classes and from any prejudices which they might suffer by inability to take part in examinations. So successfully did the Scotch students carry out the work which they undertook to do that at a meeting of the board of managers of the Royal Infirmary, Edinburgh, held on May 17th, it was reported that seven letters had been received from strike committees and trade unions protesting against what was characterized as "blacklegging" by university students during the general strike, and threatening in retaliation the withdrawal of workers' contributions to the infirmary. It was pointed out by Sheriff G. L. Crole, one of the managers, that the board had no jurisdiction over the students, and it was suggested that the unions should receive a reply to that effect. Sir Malcolm Smith, who presided, said that he thought the letters had been written under a misapprehension. It was suggested by one manager that the board should voice its sympathy with the trades council and other similar bodies; but the chairman, in reply, pointed out that to begin to express sympathy for one or other side was a very delicate thing for such an institution to do, and it was agreed that replies should be sent to the effect

that the board had no jurisdiction over the medical students. This action of strike committees seems to be part of the general policy, for a similar letter was addressed to Guy's Hospital and received a similar reply.

At a recent meeting of the British Empire Cancer Campaign, in London, the following grants were made: £1,695 to St. Bartholomew's Hospital, towards the maintenance of their new X-ray Cancer Research Department; £2,500 to the Cancer Hospital (Free), towards the upkeep of their Cancer Research Institute; £3,000 to the Middlesex Hospital, for cancer research purposes; £300 to Dr. Malcolm Donaldson, in connection with his investigations into certain inoperable cases of

cancer; a further £250 to St. Mark's Hospital for cancer research purposes, making a total grant of £500 for the year; £300 to Professor Charles Walker, of the Liverpool University, to defray certain cancer research expenses; and £300 to Professor Wilkie, professor of surgery, Edinburgh University, for the purchase of apparatus and material for use in connection with cancer research. These grants, together with the provision for commitments entered into by the campaign, approximate to an expenditure of £85,000 to date. The grand council was informed that the first number of the publication, to be known as the *Cancer Review*, of the campaign would be issued during the month of May and would continue thereafter as a monthly publication.

NEW ZEALAND

A full report has been made of the recent epidemic of anterior poliomyelitis in New Zealand. This is the second serious epidemic of this nature in that country within eight years, and according to the figures received is of greater proportions than the outbreak in 1916. The number of notifications for 1924-25 was 1,257, with 166 deaths, and in 1916 it was 1,018 with 123 deaths.

In comparison with epidemics in other countries, that in New Zealand showed a greater number of notifications than in the very severe epidemic of 1916 in the north-eastern section of the United States, but the number of deaths in New Zealand was slightly lower. This is taken as an index of very careful reporting of mild cases. The age incidence was typical of the disease in that young children were most generally affected. The early reports indicated a very severe type of disease, and it was feared that the total amount of paralysis would be formidable.

Although, however, there were 166 deaths, later reports from all centres state that recoveries from paralysis have been unexpectedly numerous. This is taken to mean that a distinct advance in treatment has been made, since a high death rate usually means a high paralysis rate also. Emphasis is laid on the fact that the majority of patients were promptly sent to hospitals. Careful splinting and posturing were the usual practice. Convalescent serum was used to a considerable extent, and the consensus of opinion was that when given in the preparalytic stage this serum was curative.

Much pathological and bacteriological investigation was carried out in connection with this epidemic, but it is stated that nothing was noted which was likely to be of assistance from the therapeutic standpoint. Nor was anything new discovered regarding the method of spread. It can only be said that the evidence is very strongly in favour of its being communicated by personal contact.

H. E. MACDERMOT

SOUTH AFRICA

"The S.A. Medical Journal," in an editorial dealing with 1925, states:—"Of the new registrations, we make out 52 to have been of South African qualifications, 128 of British, 9 Holland, and 4 from elsewhere. This shows that the South African universities are now actively functioning, and it must be borne in mind that a considerable proportion of the students of the University of Capetown, although not so many as formerly, migrate overseas for the latter part of their curriculum, and thus graduate abroad, although they have had an important portion of their training in South Africa. This migration seldom or never occurs from the University of the Witwatersrand, doubtless because of its ample clinical opportunities. One may mention, *en passant*, that it is abundantly evident that both our local medical schools keep up their standard commendably, which does not always happen with new institutions. It is curious to note the changes which take place in the predilections of the South Africans who proceed to overseas as regards particular medical schools. Some few years ago there was quite a considerable gravitation to America. Now either this gravitation has ceased, or, what is hardly likely, some of our students are remaining in America, for the registrations have almost reached a vanishing-point. The registrations of Holland qualifications are also diminishing. Most curious of all is the way in which Edinburgh registrations have been dropping off in recent years, for all of us know that, for a genera-

tion or more before the War, that ancient university attracted all but a very small minority of the South Africans who took up medicine. Immediately after the War, Dublin seemed to be the place of preference, and Liverpool shared popularity with it. Within the last year or so, the larger proportion of the registrations are those of London students, and of Guy's especially."

The following extract is taken from the *South African Medical Record* of April 24th.

"In speaking on the second reading of the Medical, Dental and Pharmacy Bill, the Minister for Public Health dwelt on the need for unified control of medicine in all the Provinces, and showed that the creation of the South African Universities necessitated legislative provisions which had not heretofore been necessary. He mentioned that more stringent measures for regulation of the sale of poisons were required, for it was truly said that in no country in the world was it easier to obtain poison than in South Africa. Provision was made for the registration of masseurs, as well as for that of midwives and nurses. With regard to certain persons who occupied an ill-defined position, such as physical culturists and the like, it was too early to institute actual registration, but the Bill made provision for this being done in the future. The licensing of witch doctors in Natal would be abolished, but those at present licensed would retain their rights. Natal, he

supposed, was "the part of the country where they found all things wonderful," and there were 2,150 licensed witch-doctors there, paying a license fee of £3 annually, so that the Minister of Finance netted between £6,000 and £7,000 from them. He mentioned that the calling of these people was so remunerative that instances had been known of fully qualified medical practitioners preferring to register as witch-doctors."

The minister dealt at length with the much-agitated point of the recognition of the "pathies" and "cults". He said, "All those who practise these cults will be allowed under the Bill to practise, but they must not do so for hire or gain, or if they do for hire or gain, they must do so under proper medical supervision. We require by law to-day in South Africa that no person who is not properly trained and qualified and certified will be allowed to handle delicate electrical machinery, because it is something that may have to do with life and death. The human body is a much more delicate and complicated machine than electrical machinery, and

it is only right that persons who handle the human body, who practise medicine, should be properly trained and qualified."

And again, as regards the discrimination provided for in the Bill between the qualified medical practitioner and the unqualified man: "that discrimination is certainly for the protection of the medical profession. But, while it is not proposed to create a monopoly, if we do not protect the man who is properly trained and qualified, the result will be that the medical profession will, as such, be depreciated. The principle of discrimination between the qualified and the unqualified man rests in the first instance on the belief in the acquisitions of science and the correctness of scientific methods. It has become the duty of the Government to protect the public against ignorance and the abuse of remedial measures. The quack remedy is surrounded by an atmosphere of mystery; quacks have got their secrets. Medical science, on the other hand, has no secrets."

News Items

GENERAL

Dr. D. C. Balfour, a graduate of the University of Toronto, now with the Mayo Clinic, has offered to the University of Toronto \$4,000 for the establishment of a lectureship in surgery and the board of governors has gratefully accepted his offer. This foundation will probably be used to bring notable surgeons from time to time to the university to deliver special lectures.

Professor C. L. Starr, of the University of Toronto Medical School, recently returned from the Harvard Medical School, where he assumed the chair of surgery for four weeks during the absence of Professor Cushing in Europe.

An expedition to study diseases in Africa under the auspices of Harvard University and to throw light on little known forms of life sailed for England on May 15th where they will be outfitted. The expedition is headed by Dr. Richard P. Strong, director of the Institute of Tropical Biology. Special attention will be given to the study of sleeping sickness, and the effects of drugs on the disease.

This expedition, which is a continuation of the Amazon expedition of 1924-25, will occupy a year and is certain to result in the discoveries of some new diseases, as it will penetrate country, study men and plant and animal and insect life which have never yet been surveyed in this way.

Plans for a survey of research facilities in American universities in the field of pure science were made at a preliminary conference at the University of Pennsylvania on May 3 of representatives of universities, research institutions, foundations supporting research efforts, commercial laboratories and national scientific societies. The conference passed a resolution endorsing heartily the project of the National Academy of Sciences for the National Research Endowment. Secretary Hoover, Mr. Root and Mr. Hughes are leading the endowment campaign to raise \$20,000,000 to aid American universities in carrying on fundamental research during the next ten years.

The *American Journal of Surgery* of which Dr. Brickner has been editor for twenty-one years, has been purchased by Paul B. Hoeber, Inc., medical publishers. It is planned to increase the size of the journal and Drs. Harvey Cushing, Joseph A. Blake, Rudolph Matas,

Fielding H. Garrison and others will join the advisory editorial staff, in association with Dr. Brickner.

The Willard Gibbs Medal of the Chicago section of the American Chemical Society has been awarded this year to Sir James Colquhoun Irvine, of the University of St. Andrews, Scotland. The presentation will take place at the September meeting of the Chicago section when Dr. Irvine will be in this country to attend the Philadelphia meeting of the American Chemical Society.

The University of Rochester announces that the formal opening of its school of medicine and dentistry will be on October 25 and 26. There will be scientific medical conferences on these two days. Papers will be presented by Professor Friedrich Müller, of Munich; Dr. C. J. Martin, president of the Lister Institute of London, and by other leaders in medical science. The formal invitations will be sent out some time in September and the program will probably be complete before that date.

The director of the Brooklyn Botanic Garden calls special attention to the effective work which the Botanic Garden is doing for wild flower conservation, in co-operation with other organizations. This included securing the passage of legislation by the State Legislature so as to include various wild flowers in the conservation law, the growing and distribution of wild flowers now in danger of extinction, and the preservation of the wonderful weeping beech at Flushing, in Queens Borough. This is considered to be the largest and most beautiful specimen of this species of tree in the world. It would have been cut down to make way for an apartment house had not the Botanic Garden and other organizations supported the Park Commissioner of Queens in a campaign to save the tree.

Dr. Gager, the director of the garden calls attention to the disastrous effect on the trees of the garden and of all the city parks, especially the evergreen trees, by the soot and fumes produced by the burning of oil and soft coal during the past winter. The seriousness of this menace to all city trees can hardly be exaggerated.

It is reported from Paris that Professor A. Pettit, of the Pasteur Institute, has been deputed by the French government to organize a similar Pasteur Institute at

Montreal at the request of the University of Montreal, of which it will be a department.

Sir Spencer Lister, research bacteriologist for the South African Institute of Medical Research, Johannesburg, arrived in New York on April 17.

Dr. Walter Lehmann, director of the Research Institute Museum of Berlin, Germany, is visiting the United States.

Major J. Hall-Edwards, a pioneer worker in x-ray therapy, has been elected an honorary member by the council of the British Medical Association in recognition of his services to medicine.

It is reported from Leningrad that a translation of Professor Pavlov's book on "Conditioned Reflexes" will soon be published in the English language. The translation is being made by Dr. W. H. Gantt, an American who for the past eighteen months has been working in Pavlov's laboratory.

We regret to have to record the sudden and unexpected death of Dr. E. H. Bradford of Boston, Massachusetts, one of the pioneers of orthopedic surgery in Boston, and author, with the late R. W. Lovett, of *Orthopedic Surgery*, a standard text-book of the subject. He had retired from practice some time ago.

Sir Harry Brookes Allen, professor of pathology and dean of the faculty of medicine at Melbourne University, Australia, has died, aged seventy-one years.

The degree of Doctor of Laws will be conferred on the occasion of the bicentenary celebrations of the Faculty of Medicine of the University of Edinburgh in June on Dr. A. Balfour, director of the London School of Hygiene and Tropical medicine; Dr. R. Howden, professor of anatomy, Durham; Sir George Newman, Ministry of Health, London; Dr. Alexander Primrose, professor of clinical surgery, University of Toronto; Sir John Robertson, professor of public health, University of Birmingham; Dr. Ralph Stockman, professor of

materia medica and therapeutics, University of Glasgow; Dr. A. L. Turner, president of the Royal College of Surgeons, Edinburgh; Sir Norman Walker, formerly senior lecturer on diseases of the skin, Edinburgh, and Mr. J. T. Wilson, professor of anatomy, University of Cambridge.

The University of St. Andrews will confer the honorary degree of LL.D. on Dr. E. F. Armstrong, director of the British Dyestuffs Corporation; Dr. George Forbes, distinguished by his pioneer work in electrical engineering and popular writings on astronomy; Mr. E. S. Harkness, of New York, founder of the Commonwealth Fund, and Professor E. T. Whittaker, professor of mathematics and dean of the Faculty of Arts in the University of Edinburgh. The degrees will be conferred at the graduation ceremonial to be held on June 29.

With total assets of \$199,031,338, consisting chiefly of gifts of John D. Rockefeller, the annual report of the Rockefeller Foundation for the year ending December 31, 1924, now issued, states that income during the year was \$8,191,338 and expenditures were \$7,288,822. The balance on hand was \$7,607,187 as compared with \$6,704,503 in 1923. The expenditures included \$1,676,495 for checking hookworm, malaria and yellow fever; \$405,876 for public health education; \$1,146,297 in China, and \$2,045,293 for medical education.

John D. Rockefeller, Jr. has made an unconditional gift of \$125,000 to the American Society for the Control of Cancer of New York, according to an announcement by Winthrop W. Aldrich, who is in charge of the campaign of the society for an endowment of \$1,000,000. Mr. Rockefeller also made a gift of \$10,000 to defray the expenses of a congress of the leading cancer specialists of this country and Europe at Lake Mohonk in September. A luncheon was to be held at the Lawyers' Club, 115 Broadway, on May 6, by the committee and others interested in the society's work. The speakers were Dr. Wood, Dr. James Ewing and Dr Taylor.

NOVA SCOTIA

Dr. F. J. A. Cochran has removed from Seabright to Grand Harbour, Grand Manan, N.B.

The new Colchester County Hospital, at Truro, is nearing completion and will be opened within a few weeks.

Drs. T. B. Day, of Thorburn, and D. R. Sutherland of Tusket, have been appointed coroners for the counties of Pictou and Yarmouth respectively.

The government of Nova Scotia has decided to contribute \$10,000.00 a year for three years to the work of the Nova Scotia Tuberculosis Commission.

Nine nurses were graduated, with appropriate ceremonies, from the Yarmouth Hospital on May 18th. Dr. S. W. Williamson addressed the class, while diplomas were presented by Mayor Kinney.

The Department of Public Health, Nova Scotia, recently reported the vital statistics for the month of January. There were 935 births and 560 deaths during the month. The infant mortality rate was 57.7.

For the calendar year 1925, the city of Halifax is credited with 1584 births and 129 infant deaths. This

gives an infant mortality rate of 81.4. More than half of the infant deaths were attributed to premature births and congenital defects.

In the early part of June a team composed of Drs. L. M. Murray, Toronto, F. S. Patch, Montreal, and E. Kirk Maclellan, Halifax, will address various local medical societies of Nova Scotia in furtherance of the Canadian Medical Association's programme for extra-mural post-graduate instruction.

The new building of the St. Martha's Hospital, Antigonish, was formally opened on the eleventh of May. Less than twenty years ago St. Martha's Hospital had its beginning in a cottage with six beds. Later it removed to a more commodious building, which was enlarged from time to time until sixty patients could be accommodated. Now it is established in a splendid fire-proof structure costing upwards of \$300,000.00, modern in every appointment, and with accommodation for more than a hundred patients. This is a noteworthy achievement in a town of less than 2000 population.

The Sisterhood of St. Martha had its origin in Antigonish, having been established to meet the house keeping needs of the University of St. Francis Xavier. So successful did it prove in this capacity that, when a

hospital was established in the little town, it was decided that it should be administered by the new sisterhood. From the first, the hospital was conducted so admirably that the Sisters of St. Martha gained quick recognition as most efficient administrators, and several years ago the St. Joseph's Hospital, at Glace Bay, was placed in their competent hands.

The new St. Martha's was dedicated with appropriate ceremonies in the presence of a large concourse of admiring and enthusiastic friends. Rev. Father MacMillan, president of the Board of Directors, presided. He reviewed the record of the hospital briefly and with pardonable pride. Mayor Fall then spoke on behalf of the townfolk, after which Lieutenant-Governor Tory paid a well deserved tribute to those whose labours had resulted in such a magnificent new home for the institution. When he unlocked the door of the hospital with a silver key, and declared the institution formally opened, a mighty shout went up from the assembled multitude. Felicitous addresses followed from clergymen of the United and Baptist churches, the Hon. William Chisholm and other parliamentary representatives—Messrs. Rice, Giffin and O'Handley. Then followed Drs. George H. Murphy and H. A. Chisholm, of Halifax, both natives of Antigonish County, who congratulated the hospital authorities upon the success which had attended their efforts, dwelt upon the value

of the hospital to its constituency, and bespoke the support of the people generally. Right Reverend Bishop Morrison closed the proceedings with an address in which he praised the spirit of all associated with the enterprise.

The new hospital is placed in such close proximity to its predecessor as to permit of the old building being utilized as a residence for nurses. Situated on high ground, it is conspicuous to a large section of country, and the view from its windows is extensive and beautiful, embracing hills and vales, river and bay, and the pretty green-bowered town. Much care was given to the planning of the building, which has been designed with every consideration to the comfort of the patients and ease of administration. The public wards furnish accommodation for forty patients, while private and semiprivate rooms will accommodate more than sixty. Wards and rooms are of unusually generous proportions, and the furnishings are all that could be desired. The operating rooms are very finely planned and equipped, and equal care has been taken in the provision for the laboratories and x-ray department. In every particular the most modern ideas find representation.

The medical staff of St. Martha's Hospital is composed of Drs. J. J. Cameron, J. L. MacIsaac, W. F. MacKinnon, R. F. MacDonald, Alex. Kennedy, Owen J. Cameron, and D. J. McMaster. W. H. HATTIE

NEW BRUNSWICK

At the June meeting of the Board of Commissioners of the General Public Hospital, Dr. W. F. Roberts was appointed director of the Department of Physiotherapy. This appointment will fill a long felt want as the treatment of cases requiring physiotherapy has in the past been rather haphazard. To accept this position it was necessary for Dr. Roberts to resign his seat on the Commission. Dr. Roberts has been an active member of the Commission for a number of years, and has been responsible for many of the advantageous changes brought about recently. His resignation will take effect on July 1. It is expected that his transfer to the Medical Board will add strength to that body.

Dr. E. J. Ryan has lately returned from Philadelphia where he spent the winter doing post graduate work in genito-urinary diseases. It is rumoured that Dr. Ryan will return to Philadelphia in the fall to accept a teaching position.

Dr. H. L. Abramson, Provincial Pathologist, has just returned from Roberval, Quebec, whither he was called by the Attorney-General of the Province of Quebec to give evidence in the murder trial of Mrs. Gallop. Dr. Abramson was accompanied by Dr. D. W. Ross of Fredericton, who was also a witness.

The directors of the Jordan Sanatorium at River Glade appeared before the New Brunswick Government on June 11, and presented a proposition for expansion at the institution. The proposal was for the erection of a new building at an estimated cost of \$120,000.00 of which \$100,000.00 would be provided by the Jordan Estate, the province to furnish the balance, and the maintenance cost which is estimated at \$15,000.00 per annum. It is to be hoped that this proposal will bear fruit.

The June tour of visiting lecturers under the extramural scheme of the Canadian Medical Association, brought to New Brunswick, Dr. L. J. Rhea, Dr. L. H.

McKim and Dr. Grant Campbell. Their itinerary comprised the towns of Woodstock, Fredericton, St. John, Moncton and Campbellton. Dr. Rhea dealt with pathological changes in the heart; this difficult subject was so clearly handled by him that its importance was greatly enhanced. Dr. Grant Campbell spoke of new work in scarlet fever and Dr. L. H. McKim's remarks on surgery of the hand gave rise to a sharp discussion. The methods he advocated, although not entirely new, were backed by a large experience, and the results reported were most satisfactory. A feature of this tour was the fact that the three gentlemen all came from one hospital; the Montreal General. This it seems to the writer is an excellent plan. A group of men from one institution carries with it an *esprit de corps* and enthusiasm that is hard to attain with a mixed group. This group from the Montreal General has set a mark of popularity which will be hard for succeeding teams to equal.

Within the last few days there has developed at Moncton, two cases of acute epidemic cerebrospinal meningitis. One of the victims has already died, and the other is in a precarious state. Both these cases showed the subcutaneous hemorrhages characteristic of spotted fever. The feature of interest is the fact that these patients had but just returned from a religious meeting in Montreal. Both were adults, and it is reported that there are other cases in other parts of the country, whose infection can be traced to the above mentioned meeting.

The New Brunswick Medical Association will have unfortunately only a small representation at the meeting of the Canadian Medical Association in Victoria. Distance prevents a larger group attending. It is the hope of the St. John Medical Society that the Canadian Medical Association will be able to accept their hospitality for the annual meeting in 1927 or 1928. The Canadian profession will be assured of a hearty welcome in Canada's Premier Atlantic Port City, and members who attended the meeting at St. John in

1914, will be able to bring to mind many of the points of beauty and interest, with which they were made acquainted in the Maritime country.

Dr. W. E. Rowley of St. John who suffered a fracture of the leg in the winter is convalescing in Long Island at the home of his brother. Reports state that the doctor is doing very well.

Preparations for the annual meeting of the New Brunswick Medical Society are well in hand. Dr. J. R. Nugent, Secretary, and Dr. Sormany of Shediac,

president elect, have spared neither time nor enthusiasm in their efforts to make this July meeting the best in the history of the Association. Acceptances are at hand from outstanding speakers in Montreal, Halifax and Boston. The papers offered by the local members also appear to be of marked interest.

Dr. S. H. McDonald of St. John has been confined to the St. John Infirmary for some time, suffering from infection of his nasal sinuses. The latest reports state that his condition is much improved.

A. STANLEY KIRKLAND

QUEBEC

Dr. A. H. Pirie, has been elected president of the American Roentgen Association.

The death of Dr. Joseph Louis Hypolite Martel, eye, ear, nose and throat specialist connected with Hotel Dieu for twenty-five years, occurred suddenly at his summer residence in Chambly Basin, quite recently. Born forty-seven years ago at Chambly Basin the son of Dr. Charles Martel, who was a member of the Quebec Legislature, he was educated at Montreal College and Laval University, where he graduated in medicine. He became attached to the Hotel Dieu a short time after graduating and remained until the time of his death. As a lover of flowers Dr. Martel was well known among the residents of Chambly Basin.

Ninety-four graduates of McGill University received the degree of M.D., C.M., at the Annual Convocation on May 28, 1926. The geographical distribution of the graduates was as follows: British Columbia 8; Alberta 7; Saskatchewan 3; Manitoba 3; Ontario 20; Quebec 24; New Brunswick 2; Nova Scotia 5; Prince Edward Island 5, in all seventy-seven Canadians.

From Newfoundland 3; British West Indies 3; United States 9; Guatamala 1; Italy 1. The Holmes Gold Medal for the highest standing throughout the

course was awarded to Kenneth I. Melville, Kingston, Jamaica; the Wood Medal for the highest standing in the clinical subjects to Arthur A. Haig, Claresholm, Alberta, and the Final Year Prize to William K. Burwell, Renfrew, Ontario.

The convention of the Montreal League for the Hard of Hearing, a recently formed organization, of which Miss Margaret J. Worcester, is the president was held recently and addresses were given by General H. S. Birkett of Montreal; Dr. Gordon Berry of Worcester, Mass.; Dr. Max A. Goldstein, of St. Louis; Miss Dr. Horace Newhart, of Minneapolis, Minn., and Dr. R. H. Craig of Montreal. The object of the league "is to foster and encourage the study of speech reading and form a social centre group for the hard of hearing adult of Montreal." It stands for the principle that speech reading is the best substitute for perfect hearing, and is equally valuable where the hearing is but slightly impaired or totally lost, not only as a means of communication, but for its mental effect upon the individual. "It desires to bring before the public and the proper authorities the knowledge that deafness, if treated in its incipient stages, is largely preventable. Prevention can be assisted by the regular examination of the ears of children and their proper treatment."

GEORGE HALL

ONTARIO

A medical staff has been organized for the Norfolk General Hospital, Dr. J. S. Boyd is chairman, and Dr. R. B. Hare secretary.

Dr. Boyd as chairman of the board of health, and Dr. Jackson as the medical officer of health, have organized a monthly chest clinic for the county of Norfolk. At the last meeting of the clinic Doctors Holbrook and Cornette of the Hamilton Sanitarium examined twenty patients who had been brought there for inspection.

Dr. D. J. Sinclair of Woodstock has gone abroad to visit the hospitals in Great Britain and the continent.

Queen's University graduated fifty-two men with the degree of M.D.C.M., these are the first of the sixth year men.

The David Edward Mundell Scholarship of \$50.00 awarded to the student making the highest aggregate marks in the Surgical Applied Anatomy final examinations of the fifth and sixth years was given to W. Alex. Newlands, B.A. Kingston.

The International Committee of Mental Hygiene

Scholarship of \$50.00 awarded to the student making the highest number of marks in psychiatry was divided between W. H. Berry, Seeley's Bay, and Maxwell Gosse, B.A., St. John's Newfoundland.

The prize of \$20.00 in gold given by Dr. James of Mattawa for the best examination in final year medicine and clinical medicine was awarded John Lansbury, Wellington.

The prize given by Dr. James Miller for the best series of pathological cases was awarded to Quartus Bliss, Kingston, and H. C. Burleigh, Kingston.

The Professor's Prize in medicine and clinical medicine was given to C. Everard Lyght, Hamilton.

The medal in medicine was given to Nathan E. Berry, of Seeley's Bay, and the medal in surgery to Alex. E. W. Ada, B.A., of Kingston.

There were nineteen graduates in medicine this year at the University of Western Ontario. The J. B. Campbell Memorial Scholarship in medicine was won by Angus Neil McKillop. The J. B. Campbell Memorial Scholarship in physiology was won by Maynard Neil

Laurie. The Class of 1917 Scholarship was won by Roland Webb Jones. The Khaki University and Y.M.C.A. Scholarship was won by George Walter Robinson. John Dearnness, a former professor in biology of the Medical School, received the honorary degree of LL.D.

Doctors Wilfrid Lamont Graham, Milne Cobb Harvey, and Hugh David Logan of the University of Toronto Medical Faculty were among the successful candidates in the fellowship examination at the Royal College of Surgeons of Edinburgh.

The Harvey Club of London met on Tuesday, May 18th, Dr. H. O. Foucar addressed the meeting, taking as his subject "The life of Dr. Trudeau".

The Halliday Memorial Lecture, a part of the annual programme of the Peterboro Medical Society was given this year by Dr. Norman Gwyn of Toronto, who by the request of the society spoke on "Some of the important details in the professional and teaching life of Sir William Osler". This lecture is given annually as a memorial to the late Dr. J. T. Halliday who had practiced for years in Peterboro and the district. A graduate of McGill in 1865, Dr. Halliday became the outstanding figure in medicine in the county of Durham, not only for his interest in medicine and surgery but for his kindness to the world in general and to the young new-coming practitioner in particular. This feature of the old doctor was especially stressed by Dr. McPherson, president of the Peterboro Society in making his introductory remarks. A typical doctor of the old school loved by his patients, and respected by his

associates, Dr. Halliday will long be remembered. It might be urged that in other county societies similar memorial lectureships should be instituted, as it is felt by many that no better tribute could be given to the splendid type of practitioner existing in these provinces.

The fiftieth annual session of the American Association for the Study of the Feeble Minded, held its meetings in Toronto early in June. In addition to the society's transactions, open meetings were held in the Physics Building of the University of Toronto. At these meetings the question of the relation of social inadequacy to mental deficiency were investigated from many angles. The Association was received by Mayor Foster, Canon Cody and the Honourable J. Thompson.

Dr. G. Stanley Ryerson, the secretary of the Medical Faculty of the University of Toronto permits us to make public the following details in connection with the graduating class of 1926. Number up for examination 188; number passed with honours 9; number passed 174; number conditioned 4; number who have failed 1.

The following awards were made: The Faculty Gold Medal, T. A. Sweet; First Silver Medal, Mrs. I. T. Day; Second Silver Medal, N. A. McCormick; George Armstrong Peters Prize, D. W. Pratt; Chappell Prize, G. B. Balfour; J. J. Mackenzie Prize, Miss L. F. Coates; Ellen Mickle Fellowship, D. W. Pratt; Charles Mickle Fellowship was awarded to G. F. Dick, M.D. and Mrs. G. R. Dick, M. D., in recognition of their work on scarlet fever; Alexander McPhedran Fellowship to Dr. E. J. Maltby; Reeve Prize to H. Borsook, M. A.

MANITOBA

In addition to the two new storeys now under active construction for the Medical Arts Building, Winnipeg, the plans call for an assembly room fifty by thirty-two feet with accommodation for two hundred people, committee room, cloak room, kitchen, and possibly a small suite of rooms. All the office space is already let. The directors of the building are completing arrangements for a reading room and library in one of the new rooms.

The attendance at the various meetings held from June 8th to 14th under the extra-mural post graduate scheme and addressed by Drs. Meakins and Nutter of Montreal was very good and much interest was displayed. The centres at which meetings were held were Winnipeg, Portage la Prairie, Minnedosa, Brandon, Ninette and Morden.

Dr. H. D. Kitchen, who graduated in 1921, held a fellowship on the Mayo Foundation at Rochester, Minn., and is now a lecturer in biochemistry in the Faculty of Medicine, University of Manitoba, is the first winner of the Prowse prize which consists of a bronze medal and a sum of money.

Dr. Manly Finklestein who has been City Bacteriologist for five years, has resigned to engage in private practice, and will be succeeded by M. S. Loughheed, M. S., B.A., B.Sc. (Oxon).

Dr. M. M. Wintrobe is the first man to be appointed to the Gordon Bell Memorial fellowship of the College of Physicians and Surgeons of Manitoba.

The fellowship was established in 1924 in memory of the late Dr. Gordon Bell, for the purpose of encouraging research work in medicine.

Dr. Wintrobe at present an interne in the Winnipeg General Hospital, has just completed a successful course in arts and medicine at the University of Manitoba. He graduated with honours in both faculties, obtaining scholarships and gold medals in political economy and French, and scholarships in each of the first four years of medicine.

Dr. Wintrobe will undertake research in connection with pernicious anaemia and the leukæmias, under direction of the medical research committee of the university.

Dr. D. A. Stewart, Superintendent of the Manitoba Sanatorium gave an address on "Septic infections of the lungs and bronchi" at the thirty-ninth Annual Meeting of the N.D. State Medical Association, Minot, N. Dak.

The annual meeting of the Winnipeg Medical Society was held on May 21. The retiring president Dr. H. W. Wadge read an interesting and trenchant address on "Present day tendencies in medicine" and set forth some of the problems yet to be solved.

The election of officers resulted as follows: President, Dr. J. D. McEachern; Vice-President, Dr. Hugh MacKay; Secretary, Dr. M. Loughheed; Treasurer, Dr. W. E. Campbell; Trustee, Dr. H. P. H. Galloway; Representative to Manitoba Medical Association, Dr. H. W. Wadge.

Dr. T. G. Hamilton gave an address covering seven years experiments and experiences in psychical research which was illustrated with numerous slides made from flashlight photographs and charts. The address created keen interest and there was an animated discussion at the close.

SASKATCHEWAN

The annual meeting of the Saskatchewan Medical Association will be held at Saskatoon September 20th and 21st. The speakers from outside the province will be Sir Henry Gauvain, London, England, Dr. George Hale, Professor of Medicine, University of Western Ontario, Dr. Fraser Gurd, Associate in Surgery, McGill University, and Dr. R. R. MacGregor, Professor of Pediatrics, Queen's University, Dr. T. C. Routley, General Secretary, Canadian Medical Association, will also be present. In addition to the above there will be various speakers from within the province. A very large attendance is expected, and it is confidently anticipated this will be one of the best meetings of the Association. It is hoped that every doctor in Saskatchewan will reserve these dates.

Dr. J. G. MacDougall of Halifax, Dr. E. H. Mason of Montreal, and Dr. V. E. Henderson of Toronto, are at present conducting the first Saskatchewan post graduate tour. Meetings are being held at the following points: Yorkton, Saskatoon, North Battleford, Prince Albert, Weyburn, Moose Jaw, Regina, Swift Current. A full report of these meetings will appear in the next issue of the *Journal*.

Dr. H. O. Redden, who practised medicine for several years at Outlook, died recently from meningitis in a hospital in Saskatoon.

Dr. B. R. Burwash, who has been taking post graduate work, has resumed practice at Hawarden.

A second tour has been arranged for July when Drs. Austin of Kingston, Fitzgerald of Toronto, and

J. H. Mullin of Hamilton, will address meetings at Swift Current, Moose Jaw, Weyburn, Regina, Saskatoon, Rosetown, North Battleford, Prince Albert, Melville.

Dr. G. C. Currie is now associated in practice with Dr. D. S. Johnstone at Regina.

Dr. W. S. Boyd has opened an office and is now practising at Estevan. A. MACG. YOUNG

The June monthly meeting of the Regina and District Medical Society was incorporated in the visit of the second post graduate lecture team of the Canadian Medical Association. A luncheon was held in the General Hospital at noon, following which several interesting cases were presented in a clinic discussion which in each case was opened by the visiting professors. Following a dinner held in the restaurant of the Parliament Buildings at which over fifty members sat down, the following programme was presented. Dr. MacDougall, of Halifax gave a paper on "Conditions associated with cystitis." Dr. Henderson, of Toronto a paper on "The newer drugs." Dr. Mason of Montreal a paper on the "Iodine treatment of goitre conditions." These papers were much appreciated by all. On Sunday, the 13th, the visiting professors were driven to Fort Qu'Appelle Sanatorium, and were favourably impressed with the care of tuberculosis patients in Saskatchewan.

Saskatchewan was well represented at the Canadian Medical Association meeting in Victoria.

We are pleased to have Dr. Hall, Sr., of Fort Qu'Appelle with us again after a winter in California recuperating from a severe illness.

Dr. Creighton of Estevan is in Europe doing post graduate work. R. McALLISTER

ALBERTA

Dr. Stroud, a recent graduate, has accepted an appointment to the staff of the Mental Hospital at Ponoka, replacing Dr. Brodie, who is now practising in Calgary.

Dr. S. Astroff has returned to Alberta after an absence of three years, part of which time was spent in post graduate work in England, and for a period in practice in Winnipeg.

Dr. J. D. McLean has removed from Jasper to Telfordville, succeeding Dr. R. J. Haworth, who is now in Vancouver.

Dr. I. R. Gamey, formerly of Killam, latterly of Toronto, has returned to Alberta to practice.

Dr. A. E. B. Denovan of Rockyford has moved to St. Paul, Alberta.

Dr. H. A. Robertson, a recent registrant in Alberta, has accepted an appointment with Dr. Brett at Banff.

Twenty-nine Alberta students have graduated in medicine this year, sixteen from Alberta University,

eight from McGill, and five from Toronto. The great majority are entering various hospitals as internes.

Dr. A. E. Wickens has returned from the State of Washington and has settled in Sedgewick, where he practised for a number of years.

Dr. J. C. Shillabeer will look after Dr. R. D. Robertson's practice in Wetaskiwin whilst the latter is in the east doing post graduate work.

Dr. Morley Salmon of Calgary, and Dr. F. J. Stewart of Stavely, have returned from a few weeks' holidays, both much benefited in health.

The Department of Health has suggested new regulations in reference to surgical operations in hospitals, but before putting these into effect, is calling representatives of the College of Physicians and Surgeons, and of the Alberta Hospitals Association to discuss these proposals.

The Dental Association of Alberta recently had a physician before the courts for practising dentistry without a license, since he had not only removed some

offending molars but had filled teeth as well. The magistrate dismissed the case on the grounds that the doctor had the right to practice surgery and had not styled himself a dentist, nor was he desirous of being known as such. The Dental Association has appealed the case, the hearing of which will be held in September next.

On June 16th a luncheon was given in the Elizabethan Rooms of the Hudson's Bay Company, in honour of the visit of Professors Jonathan Meakins, F.R.C.P. (Edin.), and J. Appleton Nutter of McGill University, and was largely attended by Calgary physi-

cians. At the close of the repast Professor Meakins gave a most interesting talk on "The present day trend in the teaching of medical students."

Following this Professor Nutter discussed in an illuminating way "Various types of backache" from the orthopaedist's standpoint.

Both addresses were listened to with great interest and appreciation by those present.

The Council of the College of Physicians and Surgeons has donated for the second time, five cash prizes to medical students of Alberta University.

G. E. LEARMONTH

BRITISH COLUMBIA

Dr. Reginald A. Yeld of Edgewood, B.C., is leaving on July 3rd, for a three months vacation in England.

Dr. A. J. Stuart of Mission, is taking a holiday at White Rock for the next three months.

Dr. A. M. Menzies of Britannia Beach left that town on May 30th, for a month's well earned holiday, and accompanied by Mrs. Menzies will take that very interesting round trip to Skagway, Alaska. On their return they will attend the C.M.A. Convention at Victoria. Dr. W. J. Lightburne will take charge of Dr. Menzies' practice at Britannia Beach during his absence.

Dr. Edwin J. Eacrett, late of Lloydminster, Sask., is now practising at Mission, B.C., having taken over Dr. A. L. McQuarrie's practice.

Dr. J. E. Affleck of Penticton has resumed practice after an extended holiday, which included post-graduate work in the east.

Dr. T. A. Swift, of Abbotsford, through sickness, has been compelled to take a few weeks complete rest. His many medical friends trust that he will make a speedy recovery.

Medical practitioners in British Columbia are again warned to be careful before placing their accounts for collection in the hands of unknown credit bureaux. When in doubt, get in touch with the business office of the B.C. Medical Association.

The North Pacific Pediatric Society will hold its summer session at the Empress Hotel, Victoria, June 22nd. An attractive clinical programme has been arranged.

The town as well as the doctors and nursing staff of Chilliwack are to be congratulated on their hospital. It is an up-to-date, fully equipped institution, and to the credit of all concerned, is paying its own way and is not in debt. Its indefatigable matron, Miss Smith, gives much of the credit for this to the Ladies' Aid Society of Chilliwack, which has done, and is doing, so much for the hospital.

Dr. Neil MacDougall's many friends will be pleased to know that he has now quite recovered from his recent severe illness and is back at work.

The holiday season is now in full swing. Almost every mail brings the B.C. Medical Association's business office applications from doctors for relief. Any

Vancouver doctors who feel they would like to exchange with some country practitioner for a few weeks relaxation with a little fishing and shooting thrown in, should send their names to the Executive-Secretary.

Dr. C. E. Brown left at the end of May to visit his home in the east. He attended the meeting of the Ontario Medical Association, and after visiting some of the eastern clinics he hopes to be at Spokane in time for the annual convention of the Pacific North West Association. Dr. Brown will be absent from the city for about six weeks.

Dr. M. T. McEachern passed through Vancouver recently on his return from the Antipodes. He addressed the Health Bureau of the Vancouver Board of Trade on Medical Practice in Australia and New Zealand.

The recent golf tournaments between Seattle and Vancouver-Victoria have resulted in wins for our American colleagues, both here and in Seattle. The games in future are to be known as "The International Golf Contest."

Dr. A. W. Lapp, Medical Superintendent of Tranquille Sanatorium in a recent communication published in the *Vancouver Medical Association Bulletin* states that only 1 per cent of 200 tuberculous patients at Tranquille react positively to the Wassermann reaction. This figure is at wide variance with results obtained at other institutions.

Just one instance of the value of efficient organization in medicine—How many of the profession are aware that it was, we understand, through the direct representations of the Canadian Medical Association that all society in Canada benefited by that increased deduction allowance in the Federal Income Tax for children, viz., from \$300 to \$500 per child. The B.C. Medical Association hopes to accomplish a similar result along these lines in regard to the Provincial Income Tax.

Dr. Fred C. Bell, Superintendent of the Vancouver General Hospital, comparing conditions twenty years ago with those of to-day, shows that the hospital has increased its bed capacity from fifty in 1906 to 900 in 1926, and Dr. Bell adds that "striking as the work and extension are which these figures represent, they are not more so than the prospects of the still greater increase of service, which will plainly be required of the hospital in the next ten years." The experience of the past year has brought out even more strongly than previously the fact that the accommodation available is too limited to satisfy the needs of a growing city like Vancouver.

UNITED STATES

TRAINED NURSES

A report published in the *Chicago News* indicates that the Illinois State Association of Nurses, first district, has just put into effect a new policy under which its members are refusing to accept twenty-four hour duty when called on as private nurses by patients in hospitals. The demand means that a person requiring continuous attendance must employ two nurses where formerly he paid only one. For at least five years there has been increasing uneasiness among the medical profession and the public over the changing attitude of the nurse toward her vocation and her labour. What was formerly distinctly an auxiliary in the care of the sick has become split into a dozen professions and specialties, with increasing attention to management and decreasing attention to individual service. There are now nurses engaged in public health work, social service, laboratory technique, mental investigation, dietetics, roentgenology, anaesthesia, hospital management, teaching and many other positions. Too few nurses who enter the training school have their thoughts focused on the ideal of personal service to ailing humanity. Rather, it would seem, they are stimulated to the securing of one of the dignified positions that lie within the categories mentioned. Obviously, by this development, the care of the individual sick person has suffered. The possible lack of this care is responsible for the unrest that pervades medical and lay circles in the matter of nursing. At the last annual session of the American Medical Association, the House of Delegates particularly requested the Board of Trustees to look into the nursing situation and to appoint a special committee for the purpose. On previous occasions, other investigative bodies have rendered reports. Granted that there is need for such highly specialized nursing administration as has been mentioned, the needs of the individual sick are primary ones. Apparently, nurses are being trained in technical matters to a point at which dignity suffers when they are asked to undergo the tribulations of personal service. The modification of curriculums should tend to the development of more nurses who will consider the care of the sick their highest ideal.—*Jour. Am. Med. Ass.*, June 12, 1926.

State medicine in an obnoxious form is with us,

and is tending to grow under the patronage of the federal government. Physicians and private hospitals even now must compete with the federal government for the practice of those whose disabilities have not originated in government service and who are abundantly able to pay for treatment. If the bill passed by the House of Representatives becomes a law, the private practitioner and the private hospital will have to compete with the government, not only in providing hospital treatment for veterans, but in providing both hospital and outpatient treatment for veterans, contract surgeons, contract dentists and contract nurses. How long such unfair competition will continue is uncertain. But unless the present movement is checked, the outcome is sure: a greater and greater encroachment on the rights of the individual patient and physician. The House of Delegates has three times passed resolutions voicing its opposition to this type of state medicine. Resolutions, however, accomplish nothing unless backed up by action. Action must be prompt if the extension of free federal medical service is to be checked.—*Jour. Am. Med. Ass.*, June 12, 1926.

To encourage investigations of alimentary tract function, Dr. Frank Smithies, Chicago, has presented to the School of Medicine of The University of Illinois, bonds in amount sufficient to yield annually, in perpetuity, not less than \$100.00. This fund is known as "The William Beaumont Memorial Fund" and the income therefrom, as "The Annual Beaumont Memorial Award."

The award is to be made each year to the research or clinical investigator, who, in the judgment of a Faculty Committee, has contributed the most important work during the year, in the field designated.

The first award will be made in 1927. Manuscripts covering investigations do not have to be entered specifically for the award nor is it required that they be submitted to the Faculty Committee. The award is to be granted by the Committee after it has considered carefully all investigations published during any year in periodicals throughout the United States. Thus, the award is available to workers in any institution, and is not confined to members of either faculty or student body of The University of Illinois.

The eighteenth biennial conference of the China Medical Association, of which Dr. James L. Maxwell is executive secretary, will be held in Peking from August 31st to September 8th. It will meet in the buildings of the Peking Union Medical College, which is well provided with auditoriums, classrooms, laboratories, and out-patient clinics. There will be eleven sections: general medicine, general surgery, obstetrics and gynaecology, ophthalmology, oto-laryngology, roentgenology, anatomy and anthropology, physiology, public health, pharmacology, and pathology. General and sec-

tional meetings will occupy the mornings, and demonstrations and clinics will be given on the afternoons of alternate days. Special attention will be directed to public health questions and there will be public lectures each evening. Trips to interesting buildings and localities in the neighbourhood are being arranged for the free afternoons. Business meetings and elections will occupy the last two days of the conference, and a special trip to the Great Wall of China has been arranged for September 9th.

Book Reviews

The Normal Child. Its care and feeding. By Alan Brown, M.B., Physician in Chief to the Hospital for Sick Children, Toronto, and Associate Professor of Medicine in charge of Pediatrics, University of Toronto. Small octavo, 252 pp., numerous illustrations. McClelland & Stewart, publishers, Toronto, 1926.

We have read this work with much pleasure, and can recommend it as one of the best that we have seen to place in the hands of the young mothers of Canada, to whom the volume is dedicated. It presents in very clear language all the details necessary for the mother to know regarding the new born baby, its nursing, feeding, and the amount of care demanded by the growing infant. Full directions are given regarding breast feeding, mixed feeding, and artificial feeding, and feeding after the first year, also regarding the sleep, rest, exercise and play demanded by older children. Advice is given regarding the child's discipline and education, and in the last chapter excellent directions are given to the mother in regard to many of the common diseases of childhood. It is a work that should be in every Canadian mother's hands, and should be carefully studied, and the advice given closely followed. It is also a book that the physician can recommend to his patients with great confidence. The type is excellent. The material is arranged for easy reading and reference. It is of very convenient size, and as stated on the frontispiece contains just what every mother should know about the care and feeding of the child from its earliest infancy until it advances into early childhood. The book in every way is a credit to Canada.

A. D. BLACKADER

Hygiene and Sanitation. P. H. Seneca Egbert, A.M., M.D. Eighth edition. 616 pages, 154 illustrations. Price \$4.00. Lea & Febiger, Philadelphia 1926.

When a standard text-book has reached its eighth edition lengthy comment is scarcely required by the reviewer. Egbert's Hygiene and Sanitation has been revised in order to bring the subject matter up to date. The author disarms criticism of conservatism by stating in the preface that "the importance of well tried and established principles and data must be paramount in a work such as this." The emphasis, on the whole, is upon sanitation rather than upon personal hygiene and the specific control of disease. Quotations from other authors are frequent. Ehrlich's side-chain theory of immunity in a book of this character might profitably be left out. The manual presents in clear and readable form the broad principles of community hygiene and sanitation.

DONALD T. FRASER

Diathermy, with Special Reference to Pneumonia.

Harry Eaton Stewart, M.D. Second edition revised. 220 pages, 45 illustrations. Price \$3.00. Paul B. Hoeber Inc., New York, 1926.

The first edition of this work presented in a modest way the author's claim for definite symptomatic improvement in pneumonias treated with diathermy, and an apparent lessening in mortality as against controls treated without this therapeutic measure. In this revised and enlarged edition the number of case reports has been increased from sixty-seven to 248. Increasing experience leads the author to believe that improved technique is showing even better results. No trace of any injury has been recorded and no certain contraindications have come to light. Influenzal pneumonia does not respond as does lobar pneumonia. He believes

that as the treatment becomes better known it will be recognized as an invaluable adjunct in the treatment of severe cases of lobar pneumonia. A large part of the work is devoted to a careful description of the apparatus recommended and the technique of its application both in pneumonia and in the various surgical conditions.

J. H. ELLIOTT

Advising the Tuberculous About Employment. W. I. Hamilton and T. B. Kidner. 171 pages. Price \$2.00. The Williams & Wilkins Co., Baltimore, 1926.

The authors have studied in a very practical way the problem of the reinstatement of the tuberculous in industry. In this small work they have presented the results of their observations. The adjustment of the handicapped to an industrial environment is a subject of great importance, yet one on which little literature is available. In addition to their own findings and conclusions, there is a good bibliography of the more important papers and books dealing with the subject.

The doctor, the public health officer and nurse, and the patient will find much here to aid in formulating a basis on which to work in deciding upon occupation for the arrested and apparently cured case.

J. H. ELLIOTT

Modern Methods of Amputation. Thomas G. Orr, A.B., M.D., F.A.C.S. 117 pages, 125 illustrations. Price \$4.00. The C. V. Mosby Co., St. Louis. Canadian Agents, McAinsh & Co., Toronto, 1926.

This monograph is presented attractively in a small volume. The text is clear, concise, brief and comprehensive in its subject matter.

The author has omitted the history of amputations, and the descriptions of amputations that are not in common use to-day. His descriptions contain nothing superfluous, if anything he might have been a little more profuse. For instance one misses a detailed account of cutting the skin flaps in Syme's amputation. His fundamental principles are sound, and the pitfalls one meets in securing good amputation stumps, and in doing re-amputations are well brought out. The lessons taught by the late war are liberally used making this work thoroughly up-to-date. Cinematoplasmic amputations are briefly described.

One admirable feature which one sees running all through the text is the aim of the author to co-ordinate the work of the surgeon with that of the artificial limb fitter. He claims, and rightly, that if one wishes to get the best possible result from an amputation, one must produce a stump that can satisfactorily be fitted by the instrument maker.

The last chapter is a brief description of artificial limbs, and their fittings; and is one that considerably enhances the value of the book to any surgeon, and especially to those doing casualty surgery.

OLIVER S. WAUGH

Aids to Surgical Diagnosis. C. P. G. Kakeley, F.R.C.S. 170 pages. Price 3/6 net. Bailliere Tindall & Cox, London. Canadian Agents, The Macmillan Co. of Canada, Toronto, 1926.

This is a small pocket-size book. The text is clear, concise, and of a style easy to read. As the title states it takes up only diagnosis.

For a book of this size to deal with a subject such as general surgery would seem ridiculous; but it is surprising the amount of information contained between its covers. Needless to say there are no illustrations.

All the various branches of general surgery are

touched on. Each subject is taken up in order, and condensed to what the author considers to be the essentials. One feels that here and there he might have included more headings without adding much to the bulk of the work.

This book is evidently intended as a quick reference or "crash" book for the student. As one might judge from its size, there is no room for conjecture. The text is bristling with dogmatic statements. This makes it the more readily absorbed, but one cannot agree with all the dogma. The author will find few supporters of this statement, that fetal adenomata occur almost exclusively in the thyroid isthmus.

On the whole this can be a valuable little book to the student preparing for examinations, if properly used.

OLIVER S. WAUGH

The Surgical Clinics of North America. San Francisco Number. Vol. 6, No. 2. 577 pages. W. B. Saunders Co., Philadelphia and London, April, 1926.

In this issue there are twenty papers by contributors all of whom are resident in San Francisco. Seven of the papers deal with more than one subject; the contributors represent the various clinics in four of the city hospitals.

The articles are all of considerable interest and, in every case, are from the writers' own experience. The view-points taken are well substantiated by reports of cases, few in number in some instances, but convincingly described.

Leo Eloesser adds another chapter to thoracic surgery by his citation of four cases of pleural adhesions preventing collapse of the lung in artificial pneumothorax. These he treated successfully by "intra-pleural pneumolysis". Through a trapdoor opening in the upper anterior aspect of the chest he severed the adhesions by galvano-cautery, by scissors or by excising small areas of parietal pleura.

Bartlett and Callander give a lucid and well illustrated description of dissections of the neck, and Gillman describes an instrument for locating and draining hepatic abscess.

Pan-hysterectomy, as a treatment for squamous cell epithelioma of the cervix uteri, is roundly condemned by Frank W. Lynch who uses radium 3000 ma. hours followed, in two to four weeks, by a most radical dissection in cases not too far advanced for operation. In all other cases radium alone is the treatment advised. There are several other items that merit notice but space will only admit of a general recommendation to read the volume. It is a compilation of a score of themes interesting in themselves, well studied and attractively presented.

MALCOLM H. V. CAMERON

The Respiratory Function of the Blood. Part I. Lessons from High Altitudes, by J. Barcroft. Second edition. 207 pages, illustrated. Price .. London: Cambridge University Press. Canadian Agents, The Macmillan Co. of Canada, Ltd.

The appearance of a second edition of "Respiratory Function of the Blood" by Joseph Barcroft will be welcomed by all of those who take an interest in this subject. In large part the subject matter has been re-arranged; Part I deals almost exclusively with the physiological changes consequent upon residence under conditions of reduced barometric pressure. It will be of value not only to physicians who are interested in this phase of pathological physiology, but also to laymen who are devotees of mountain climbing.

In addition to the changes found in the blood, there are also important chapters on the disturbance of circulation and the methods of circulatory adaptation to new environment. A very interesting chapter

is that given to the mental disturbances under these abnormal circumstances.

The incorporation as an Appendix of the Report by Major Hingston, I.M.S., Medical Officer to the Mount Everest Expedition of 1924, is particularly apt as it visualizes as nothing else could, the tremendous physiological strain and adaptation of which the human organism is capable. I am sure that all his colleagues will congratulate Professor Barcroft on his concise but scientific exposition of the subject.

J. C. MEAKINS

Physiology. Catechism Series. Fourth Edition. Part II. 80 pages. Price .50. E. & S. Livingstone, Edinburgh. Canadian Agents, The Macmillan Co. of Canada, Toronto, 1926.

The Catechism Series is a group title of a number of small paper covered volumes each approximately eighty pages dealing with some twenty-five subjects in medicine, surgery, therapeutics, pathology, physiology and other medical and premedical subjects. Physiology for example is dealt with in four of the series, and these have reached a fourth edition. Respiration is dealt with in Parts I and II. This is followed in Part IV by a quiz on voice and speech, digestion, heat production, and the ductless glands. They afford a hurried review of some of the aspects of the subjects included.

J. H. ELLIOTT

Infant Welfare. H. H. Chodak Gregory, M.D., M.R.C.P. 142 pages. Price 4/6 net. The H. K. Lewis Co., 23 Gower Place, London, W.C.1, 1926.

This little book is written primarily for nurses and doctors in charge of a baby welfare centre. The authoress explains the organization of such a centre in England and advises the inclusion of a dispensary and an ultra-violet lamp in its equipment. She then explains, briefly, the hygiene and general care of the baby. Breast feeding and artificial feeding are well considered. The latter being a particularly good précis of the subject. The fear of caseinogen and curd formation is rather emphasized, although protein milk and acidified milks are duly explained. The description of rickets seems unnecessarily discursive for this type of book. A short account of the rashes commonly met with in infants is given, and also the common causes of pyrexia. The book is well written and printed, and should be very useful to those newly engaged in baby health centre work.

L. M. LINDSAY

Manual of the Parasitic Protozoa of Man. Charles F. Craig, M.D., M.A. 569 pages, illustrated. Price \$8.00. The J. B. Lippincott Co., 201 Unity Bldg., Montreal, 1926.

Though the protozoa are defined as animals composed of a single cell, Craig believes with Dobell that this definition is misleading because this single cell in contrast with the highly specialized cells or groups of cells we know in the metazoa or multicellular animals, takes on its various parts special functions. Its ectoplasm fulfills the functions of movement, respiration, secretion, ingestion of food, excretion and protection, while the endoplasm performs the function of digestion and contains the structures concerned in reproduction.

Among the protozoa are numerous parasites which are the cause of disease in man, while others, known human parasites are suspected of being pathogenic without as yet actual proof. The best known of the first group are those of the malarial fevers, amebic dysentery, sleeping sickness and kala-azar, and of the latter perhaps *endamoeba coli* and *trichomonas vaginalis*.

This is perhaps the first text-book in English which adequately covers the subject from a medical view point. It is for the health officer, physician,

teacher and laboratory worker rather than for the zoologist, dealing as it does only with human parasitology. An attempt has been made to include every fact of medical importance regarding the parasites described. Each organism has been considered under the following headings: Synonyms; History and Nomenclature; Morphology in Living and Stained Preparations; Resistance to Injurious Agencies; Habitat; Species Occurring in Lower Animals; Cultivation; Life-history; Method of Reproduction; Geographical Distribution; Incidence of Infection; Method of Transmission; Experimental Infection of Lower Animals; Relation to Disease; Pathology; Prophylaxis; and Diagnosis.

There is an excellent bibliography appended to each chapter, not complete, but including the most recent work. The references give some indication of the marked advance in this department of medicine in recent years. The illustrations, schematic, diagrammatic, photographic or drawn from life, aid very materially in elaborating the competent descriptions in the text.

J. H. ELLIOTT

The Book of Prescriptions. E. W. Lucas, C.B.E., and H. B. Stevens, O.B.E. Eleventh edition. 382 pages. Price 10/6. J. & A. Churchill, 7 Great Marlborough St., London; The Macmillan Co. of Canada, Toronto, 1926.

The eleventh edition of any book is a fairly accurate index of its popularity. The present edition is the first since the war and consequently the additions and changes are numerous.

The book is really a great deal more than a collection of prescriptions. It contains much information on drugs and their properties with their various preparations, and therefore approaches a pharmacopeia. The latter, however, it cannot be expected to replace. It is in all respects conveniently and clearly arranged, and should prove a useful addition to the general practitioner's library.

H. E. MACDERMOT

Handbook of Diseases of the Rectum. Louis J. Hirschman, M.D., F.A.C.S. Fourth edition, revised. 403 pages, 252 illustrations, five coloured plates. Price \$7.50. The C. V. Mosby Co., St. Louis. Canadian Agents, McInsh & Co., Toronto, 1926.

The fact that this is the fourth edition of this work presupposes a favourable reception of the earlier ones and such is clearly justified by the contents.

It is a book of about 400 pages, well printed and with some 250 illustrations and five coloured plates. As this does not include any major surgery of the rectum, it will be seen that the minor surgery has been thoroughly covered. The author, who is Professor of Proctology, Detroit College of Medicine and one of the prominent proctologists of the United States, has a very pleasing style; although evidently an enthusiastic devotee of sacral and local anaesthesia does not insist upon them as applicable in all cases.

The anatomy of the region is a happy medium between the too detailed and the cursory treatment which it sometimes receives, for it cannot be maintained that the average surgeon's knowledge of the part is sufficient for proper diagnosis and appreciation of necessary remedial measures. The sections on examination and on the technique of sacral and local anaesthesia follow the same line and bring the reader to the main body of the book, able to quickly appraise the procedures suggested and their technique.

The field of anal and rectal operations are well presented, including the author's modification of Sir Chas. Ball's operation for pruritus ani; what must appeal as a reasonable departure is the chapter on constipation and obstipation containing in addition to other measures the technique for the massage of the

lower bowel and for the dilatation of the rectum by his pneumatic bag.

As such a large proportion of rectal troubles are dependent upon a disturbance of normal defecation, the prominence given in this work seems justified.

The fifteenth chapter is contributed by Dr. John L. Jelks of Memphis, Tenn., on the various forms of dysentery, including amebic, with the treatment suggested by this recognized authority.

The work should prove a satisfactory handbook on a department of our surgical work which is distinctly on the increase.

W. S. GALBRAITH

A Classification of the Tumours of the Glioma Group on a Histogenetic Basis With a Correlated Study of Prognosis. Percival Bailey and Harvey Cushing. 175 pages, 108 illustrations. Price \$5.50. The J. B. Lippincott Co., 201 Unity Bldg., Montreal, 1926.

In this volume, two well known authors publish the results of a long and laborious research on the histopathology and classification of the tumours of the glioma group. In only a large clinic could such a study be carried out, and the authors were fortunate in obtaining specimens from, and records of more than 400 cases drawn from the surgical clinics of the Johns Hopkins and Peter Bent Brigham Hospitals over a period of twenty-one years.

Probably in no other organ is the histopathology of tumours so bewildering and so obscure as in the brain. The authors, after a careful consideration of the histopathology of their material, have evolved a classification of the "gliomata". Despite the fact that this classification is still rather cumbersome due to its subdivision into no less than fourteen major categories, it certainly adds clarity and order to these obscure lesions.

In an early chapter, the histogenesis of the brain is summarized in a clear, concise and adequate manner. Following this, there is a brief description of the various histological methods used, Golgi's method being the only important one omitted. The different cell types—twenty in all—demonstrated in their material are described and the whole series is categorized, with a description of the main features of each category. A clinical correlation between the proposed classification and the prognosis and operability of the lesion concludes the text.

The volume is abundantly illustrated with drawings and photographs of the gross and microscopic preparations of a number of their specimens. Many of these are excellent, but some microphotographs have been included which fail to convey an adequate idea of the original preparation. A rather brief but well selected bibliography is included at the end of the book.

While the sphere of this book may be somewhat restricted by its rather technical nature, it will constitute a very valuable addition to the library of the pathologist, neurologist and all who are engaged in brain surgery.

D. J. MACKENZIE

The Medical Annual 1926. 616 pages. Price 20/- net. John Wright & Sons Ltd., Bristol, 1926.

This well-known annual makes this year its forty-fourth appearance. It comprises 607 pages and is arranged alphabetically with an appendix for new appliances and drugs, recent publications and a list of British institutions for the treatment of special cases, etc. The index is complete, the more important articles being printed in heavy type. There are thirty-four contributors, mostly men prominent in their field in Great Britain and the United States. Their subject matter is culled from the literature of 1924 and 1925 and presents the newer facts and all the advanced

thoughts in medicine and surgery which would appear to have value, abstracted from the numerous journals and publications of the English speaking world.

The book is one of the best of annuals, and while it does not attempt to give complete details of diagnosis and treatment there is a very complete list of references at the end of each section with sufficient in the text to act as a guide.

It is a book which should prove of value to the practitioner as a ready means of reference to what is of importance in recent literature and a guide to the newer methods of diagnosis and treatment.

C. E. BROWN

Archives of the Andrew Todd McClintock Memorial Foundation for the Study of Diseases of the Alimentary Canal. Volume I, Pleomorphism in Bacterial Protoplasm. Andrew Todd McClintock, M.D., 240 pages, illustrated. Privately printed, New York, 1925.

This is the first publication from the Andrew Todd McClintock Memorial Foundation. It gives an outline of Dr. McClintock's life and the reason for the Foundation being formed, but it is primarily the account of his researches into psittacosis. In March, 1917, a large consignment of parrots were brought to Wilkes-Barre, Pa., and were placed on sale and exhibition in a large department store. Many of the birds were ill, they seemed to be "frozen" in the language of the store employees, and a goodly number died. Some were sold and after a couple of days the balance were sent on.

This book is the story of how an epidemic of what seems to have been psittacosis arose amongst the population of the neighbourhood from the presence of these diseased birds. The work is undoubtedly that of a keenly scientific and brilliant mind, and contains much that is stimulating and suggestive on one of the most fascinating problems in bacteriology.

H. E. MACDERMOT

The Aspergilli. Charles Thom and Margaret B. Church. 271 pages. Price \$5.00. Williams & Wilkins Co., Baltimore, 1926.

This comprehensive monograph of an important group of the ascomycetes is the result of over twenty years of research based upon some three hundred and fifty living strains comprising many thousands of cultures studied on natural substrata and also from exsiccata of several large herbaria.

The book is divided into two parts. *Part one* covers ninety pages of seven chapters devoted to general discussion, the history of this genus, its morphology, basis of description and classification, its culture, physiology and biochemistry, enzymic and fermentative activities and their industrial significance, with the list of animal diseases to which they may give rise. The mycological literature dating back nearly two hundred years has been very carefully reviewed, lucidly summarized, and one hundred and thirty-seven of the more important references are listed. Mycologists, botanists, bacteriologists, chemists, physiologists, the medical profession and students generally will prize this book highly, and appreciate the deliberate omission of technical discussions.

Part two, covering one hundred and sixty-eight pages of sixteen sections, is purely taxonomic and represents an enormous amount of exceedingly difficult work dealing with the nomenclature of the *Aspergilli*. Of the three keys, all using the dichotomous index system, leading to the identification of the thirteen groups, two shorter keys are presented for conveniently and more quickly locating the groups, the species of which are described in detail relative to bibliography, history, morphology, culture and physiology. The first

key is artificial, being based chiefly on colour. The second key is an abbreviation of the third, a much larger synoptical key of thirty pages based upon actual cultures.

The authors have elaborated upon previously incompletely described species, annotated, admirably reworked the entire genus, and have in this way made a valuable contribution to the knowledge of the *Aspergilli*.

I. I. OWER

Nervous and Mental Disorders From Birth Through Adolescence. B. Sachs, M.D., and Louis Hausman, M.D. 861 pages, illustrated. Price \$10.00. Paul B. Hoeber, New York.

Twenty years ago a second edition of Sachs's excellent book on the Nervous Disorders of Children appeared. No further editions have been brought out and the present large volume is a new and so far as the reviewer is aware, the only recent survey of the nervous and mental disorders of this period of life. The present-day drift of attention of psychiatrists and of neurologists to a somewhat lesser degree, sets more and more in the direction of childhood and the appearance of a comprehensive review is timely and will be welcomed.

The note on the jacket of the volume while more than usually conservative in its statements of the valuation of the book is, one feels, unduly enthusiastic in its estimation of the groups to which the work will be useful. "Parents, teachers, clergymen and social workers" will find the chapter on the development and training of the normal child interesting and helpful but one suspects that to most of them the balance of the ten dollars worth would be looked upon as a total loss from their standpoint. The primary appeal is to the physician, however, more especially the pediatricist and the neurologist. Such will find the book to be thoughtful, well arranged, splendidly illustrated and for the most part a decidedly comprehensive text. In fact, at first sight one wonders if there may not be much unnecessary material in so large a book. Perusal shows, however, that the evident aim of the authors has been to supply a complete treatise, one in which not only clinical data but anatomical and physiological backgrounds would be supplied.

To this end the book opens with an introductory section devoted to the anatomy and physiology of the central nervous system and an outline of methods of examination. The illustrations in this section are with three exceptions, well selected diagrams. Three x-ray reproductions illustrate ventriculography and the use of lipiodol for localization purposes. The text is orthodox and takes full note of recent advances.

Part two is devoted to organic diseases of the nervous system and here again one finds the text clear and the illustrations plentiful and good. The classification of disease entities adopted is clinical rather than anatomical and this is undoubtedly the more sensible method of presentation. Authorities are freely referred to and at the end of each chapter a good bibliography is placed. Occasional case reports, descriptions of rare types of disease, discussions of theories, etc., are placed in small type—leaving the more outstanding and the more practical points for the larger type and greater space. Very recent additions to our knowledge are noted and seem to have been weighed with conservative judgment. It is inevitable that some points for disagreement would be found but they are exceedingly few in number and of minor practical importance. For example, the authors question the occurrence of epidemic encephalitis in the new born. One clear cut case, with clinical and pathological data unquestioned, occurred in the 1919 Winnipeg epidemic.

Part three is devoted to functional and toxic conditions, there being included here consideration of

convulsions, epilepsy, speech disorder, tetanus, headaches and disorders of sleep. Little fault can be found with the presentations, in fact, they are exceedingly good. Absence of mention of heliotherapy as a useful agent in spasmophilia, of recent Italian work on epilepsy, of adequate consideration for the important group of psychogenic headaches, is noted. Therapy is thoroughly dealt with and on the whole this section is well up to standard.

The section on disorders of internal secretion is characterized by a becoming conservatism. The known and confirmed facts are presented clearly and adequately and while facts less surely proved are mentioned, it is done in a way quite in keeping with the present rather uncertain state of knowledge concerning them.

The final section devoted to mental conditions is not quite up to the standards of the preceding portions of the book. The splendid chapter on the development of the normal child is marred by a vitriolic outburst against psychoanalysis. The authors seem to take it for granted that the newer dynamic psychology consists entirely of an unquestioning acceptance of Freud's earlier and more extreme views. They make no allowance for modifications that have occurred in these theories both at the hands of Freud and others who are willing to go part way with him. They suggest that MacDougall, among others, has cast out the theories of this newer psychology as being of no account and yet MacDougall in his recently issued "Outlines of Abnormal Psychology" compares Freud with Aristotle in the profound change he has wrought in psychological thinking.

The chapters on neuroses and psychoneuroses and on hysteria are conventional accounts of these conditions, very good as far as they go but not quite as complete as one might wish in view of the present interests in these subjects.

The final chapters are unfortunate in their captions. "Insanity", a word which nowadays stands for a social and legal concept, does not seem the appropriate title for a section devoted to the consideration of psychotic states among children. Psychotic states are not common among children and psychotic states of a degree requiring commitment are certainly rare. The text of the chapter follows very closely the lines followed in any modern text-book dealing with psychotic states among adults. Little is said con-

cerning the special difficulties encountered in analyzing and appraising the major mental disorders of childhood.

The last chapter of the book is devoted to the subject of mental deficiency and contains sixteen pages—a rather small allowance for such a subject in an eight hundred page volume devoted to the nervous and mental disorders of childhood. Here also one must object to the heading of the chapter, "Idiocy and Imbecility" since it does not accurately designate the contents of the chapter. The chapter itself is a long way from being adequate in scope although the quality is good.

Generally speaking one may say that the portion of the book devoted to nervous disorders is exhaustive and adequate; that devoted to mental disorders is a disappointment.

A. T. MATHERS

Theory and Practice of Nursing. M. A. Gullan. Second edition. 234 pages. Price 9/- net. H. K. Lewis & Co., 28 Gower Place, London, W.C.1, 1925.

The appearance of a second edition of this type of work in so short a time, bespeaks for it, both usefulness, and popularity. It also assures the authoress that it is filling the niche she intended it to occupy.

The writer in the preface, to the first edition, recognizes its shortcomings and indeed these, for example in the chapters on digestion and absorption, are very apparent. They are so meagre as to detail, or so concentrated that the poor nurse can be only bewildered. It is left to the lecturers to relieve this situation. When one comes however to the nursing part of the work, one has only words of recommendation for the thoroughness, as to detail and the systematic handling of the subject in the various types of disease. The author has introduced a most important factor, and one which is most timely, particularly as nursing in many institutions at the present, is becoming too mechanical or too standardized. I refer to the personal factor which means so much to the patient.

The arrangement of the work is good. The blank pages at the end of each chapter is an excellent idea. This book we have no doubt, will continue to occupy a prominent place among the works on practical nursing.

B. D. GILLIES

Albuminuria in Children.—Joseph K. Calvin, Bertha L. Isaacs and Jacob Meyer, Chicago, have attempted to determine the causes of the so-called benign albuminurias, by analyzing two groups of children of very different environmental and physical conditions. Group 1 was composed of children having no special complaints or illnesses. They were recruited from the homes of the very poor in which hygienic conditions were at their worst, diets were improperly balanced, and teeth, tonsils and other potential foci of infection neglected. Consequently, undernourishment and anæmia were common. The second group consisted of children living in a well regulated orphans' home under the supervision of a watchful physician.

Their hygienic surroundings were very good. They lived a well regulated life with the proper balance between school work, play, recreation and rest. The meals were properly balanced. Foci of infection were eliminated as soon as discovered. Periodic physical examinations were made. It was found that the incidence of albuminuria is much higher in children under poor hygienic surroundings, having many foci of infection (untreated) and for the most part being anæmic and undernourished. That these factors do play a prominent rôle in the causation of so-called benign albuminurias in children is evidenced by the fact that many respond to the treatment of these etiologic factors. The orphanage children (group 2) have a minimum

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of these factors present, yet a small but fairly constant percentage of manifest benign albuminuria. It would seem that 78 per cent of the albuminurias in the orphanage children fit into the group classified as "growth" albuminurias. The remaining 22 per cent were of the orthostatic type. In fact, Calvin et al. believe that most of the so-called benign albuminurias in children are not of the orthostatic type; the greater proportion of benign albuminurias in children are due to the asthenia and anaemia resulting from foci of infection and to growth disturbances. Twenty-six per cent of the urines examined and 58 per cent of those showing a positive protein reaction contained either euglobulin, nucleo-albumin, mucin, or all of them, which precipitate out when acetic acid is added to the cold urine. As 26 per cent of the total were more positive in the hot urine, it is reasonable to assume that, at least in this number, serum albumin or pseudoglobulin, or both were present, and that in at least 18 per cent they alone were present, as this percentage reacted only in the heated urine. In two thirds of the analyses, the heat and cold test agreed (either positive or negative). In this series, 46 per cent of the total gave a positive protein reaction. It appears from these results that either euglobulin, nucleo-albumin and mucin, or all, are prominent components of the protein in the urine in the benign albuminuria cases, but that serum albumin, or pseudoglobulin may occur alone, even in benign albuminurias. One of the authors has conducted an albuminuria clinic for several years for the purpose of finding the cause and eliminating it if possible in these cases. Foci of infection especially chronically infected tonsils, adenoids, nasal sinusitis and abscessed teeth, are the chief offenders. Many cases of albuminuria have responded when treatment was directed toward these foci. Again, under-nourishment and anaemia often were associated with albuminuria, which responded to the overcoming of these factors. It is not believed that all of these factors (foci, etc.) have any direct specific effect on the kidney. They probably are a part of the picture associated with malnutrition or an under par condition with faulty blood volume and blood flow, resulting in hypofunction or impaired function of the body tissues. In short, the albuminuria is merely one symptom of a general systemic disturbance in these cases.

The authors direct attention to the dangerous practice of stressing the term albuminuria too greatly to the parent or to the patient. The harm done psychically may be worse than the condition physically. They offer the following classification for the convenience of the practicing physician: benign albuminuria: (a) malnutrition albuminuria, frequently associated with anaemia, underweight and systolic basal murmur. Foci of infection, especially infected tonsils, adenoids, nasal sinuses and carious teeth, are common causes of this malnourished condition. (b) Orthostatic albuminuria, associated with posture. (c) Idiopathic or "growth" albuminuria, including the terms juvenile, puberty, cyclic, transitory and intermittent. The simplest methods of treatment should be followed. The authors recommend first an intelligent explanation of the nature of the findings to the parent, explaining the simplicity and benignancy, and that it does not comprise a sickness or disease. The physician will often find that his problem is one of treating an intense, overanxious, hypochondriac parent rather than the child. Those cases which demand correction and elimination of apparent foci of infection should have these done. Nutrition should be improved and anaemia overcome. Any excessive rest cure or restricted low protein diet as a remedy is not advised. Such measures may actually result in harm to children who are physically under par. The child should be allowed to lead a normal life with only such restrictions as are necessary to overcome any malnutrition; otherwise freedom in every regard has proved to be the best remedy.—*Jour. Am. Med. Ass.*, June 12, 1926.

Results of Diathermy in Pelvic Infections—

Thomas H. Cherry, New York, finds that diathermy is probably the most satisfactory available agent for the conservative treatment in the female of pelvic infections due to the gonococcus. It relieves pain, diminishes the pelvic masses, and aids in complete resolution. Used as a preoperative therapeutic measure, it will eliminate many of the technical difficulties in the removal of large pelvic masses, and thereby contributes to a smoother convalescence. Incidentally, the percentage of post-operative wound infections is lessened.—*Jour. Am. Med. Ass.*, June 5, 1926.